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DEPARTMENT OF THE INTERIOR
FRANKLIN K. LANE, SECRETARY
BUREAU OF MINES
VAN. H. MANNING, DIRECTOR

THE MINING INDUSTRY IN THE TERRITORY OF ALASKA

DURING THE CALENDAR YEAR 1916

BY

SUMNER S. SMITH
United States Mine Inspector

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THE MINING INDUSTRY IN THE TERRITORY OF ALASKA DURING THE CALENDAR YEAR 1916.

By Sumner S. Smith.

INTRODUCTION.

The year 1916 broke all previous records of mineral production in the Territory. As a consequence, there has been a noteworthy increase in the number of mines in active operation or under development, though the greater part of the increased output is the result of greater activity at mines already producing rather than of opening new mines.

Owing to available funds not being sufficient to meet the cost of travel in the interior of the Territory during the winter months, the Federal mine inspector was unable during the spring to visit the placer mines of the interior as has been his custom in the past. However, by working in close cooperation with the Territorial inspector, who left Juneau in June to take the first boat down the Yukon to Fairbanks after the spring break-up, it was possible to visit hurriedly all the larger mining centers of the Territory. The Territorial inspector covered the districts from Fairbanks to Nome and the Federal inspector covered those of southeastern and southwestern Alaska.

A number of applicants have begun mining coal on ground held under free-use 10-acre permits, and have furnished coal for local use. The larger leasing units in the Bering River and Matanuska coal fields have been advertised and applications for leases have been submitted. These applications came too late in the fall for active development to begin before the end of the year.

The Government railroad has been built from Anchorage to the center of the Matanuska coal field, and private interests have undertaken the building of a standard-gage road from a point known as Goose City on Controller Bay to Canyon Creek, in the Bering River field. Capital has become interested in the oil fields on Controller Bay, and plans have been made for more active exploration and production.

The work of the Federal mine inspector is still handicapped by the lack of funds for additional field assistants and of the office accommodations necessary for carrying on the work with the efficiency that its importance warrants.

ACKNOWLEDGMENTS.

The preparation of this report has involved the compilation of data from many sources, and the Federal inspector gratefully acknowledges the assistance of all those who have furnished information. He extends thanks to members of the United States Geological Survey, the Alaskan Engineering Commission, the General Land Office, the Department of Justice, the officials of many mining and steamship companies, and individual miners, prospectors, and engineers. Particular credit is due Roy A. Dye, clerk to the Federal mine inspector; William Maloney, Territorial mine inspector; George R. Goshaw, of Chitina; C. H. Kraemer, George F. White, M. J. Callaghan, and M. B. Vaughn, of Valdez; R. G. Doherty, of Anchorage; and W. H. Dugdell, of Katalla.

NEW DISTRICTS.

In only one district were the discoveries of placer gold rich enough to attract unusual attention, though the limits of the known profitable areas in many of the older fields were considerably extended.

In the fall of 1915 rich discoveries were reported in the Tolstoi district, in the Innoko Basin, and during 1916 a small stampede carried a number of prospectors to that locality. So far the discoveries have not been large enough to warrant an opinion on the possible future of the district, although excellent pay was reported on Boob Creek.

The Yukon Gold Co. installed a dredge on Greenstone Creek, in the Ruby district. Although pay had been found on many of the creeks of that locality the erection of this dredge extended the limits of the district considerably and will add materially to the life of the community.

The Nelchina district ceased to exist, so far as mining was concerned, and the number of operators in the Chisana dwindled to half its former size.

The Marshall district, on the lower Yukon, showed considerable improvement, as did the Tolovana, about 50 miles northeast of Fairbanks. The best pay found in the latter district is on Livengood Creek. The short, rainy season held back work somewhat, as the water for sluicing was very limited. The post office in this district has been named Brooks.

MINERAL PRODUCTION.

The Federal inspector has not attempted to present a comprehensive collection of data on the mineral output of the Territory as it would duplicate the excellent work of the United States Geological Survey. Hence he has taken the following figures on mineral production from the advance statement of Alfred H. Brooks, of the Survey:

> The value of the total mineral production of Alaska in 1916 is estimated to have been $50,900,000; that of 1915 was $32,854,000 and was itself greater than in any previous year. The increase in 1916 was therefore over $18,000,000, or more than 54 per cent. Although this enormous increase in output was in large measure due to the large tonnage and high price of copper, yet nearly all other minerals were produced in greater quantities than in the previous year. During 32 years of mining Alaska has produced over $351,000,000 worth of gold, silver, copper, and other minerals.
>
> It can not be expected that Alaska will continue to produce so much mineral wealth each year, yet the large amount of preparation made in 1916 for lode and placer mining and the development of the coal-mining industry, now assured, give promise of a continuous healthy growth of the mining industry of the Territory. This is especially true of the Pacific coast region and of the territory served by railroads built or under construction.
>
> The Alaska mines are believed to have produced gold to the value of about $17,050,000 in 1916, compared with $16,700,000 in 1915. This makes the total value of the gold mined in the Territory about $277,900,000, of which sum $196,800,000 has been won from the placers. In 1916 about 120,850,000 pounds of copper was produced in Alaska, valued at about $32,400,000. The production of 1915 was 86,500,000 pounds, valued at $15,100,000. The total copper production to date is 340,700,000 pounds, valued at $68,300,000.
>
> The value of Alaska's lesser mineral products in 1916 was about as follows: Silver, $950,000; tin, $120,000; lead, $110,000; antimony, $60,000; tungsten, $50,000; coal, $30,000; petroleum, marble, gypsum, etc., $130,000.

PLACER GOLD.

The data in hand indicate that the value of the placer gold output in 1916 was $10,640,000; in 1915 it was $10,480,000. About 640 placer mines were operated in 1916, employing some 4,600 men. All the older districts appear to have held up or increased their output compared with the previous year, except Fairbanks. The increased output is, however, to be credited chiefly to the new camps of Marshall and Tolovana.

Thirty-six gold dredges were operated in Alaska in 1916, one more than in 1915—29 in Seward Peninsula, three in the Iditarod, and one each in the Ruby, Fairbanks, Circle, and Yentna districts. Of these 36 dredges four were installed in 1916. It is estimated that these dredges produced between $2,000,000 and $2,200,000 worth of gold. If the final figures bear out this estimate, it indicates a lower recovery per dredge than in the previous year. In 1915 the 35 dredges mined $2,330,000 worth of gold.

LODE GOLD.

About 25 gold-lode mines were operated in 1916, compared with 28 in 1915. The value of this gold output increased from $6,069,000 in 1915 to about $6,200,000 in 1916. Southeastern Alaska, especially the Juneau district, is still the only center of large quartz-mining developments in the Territory. Next in importance is Willow Creek lode district. There was also considerable gold-lode mining on Prince William Sound, but a very decided falling off of this industry in the Fairbanks district. Lode-mine owners of Fairbanks are awaiting the cheapening of operating costs, especially of fuel, which will be brought about by the Government railroad.

COPPER.

The enormous copper output from Alaska mines in 1916 has already been referred to. During the year 18 copper mines were operated, compared with 13 in 1915—seven in the Ketchikan district, eight in the Prince William Sound district, and three in the Chitina district. The enormous output from the Kennicott mine, in the Chitina district, overshadowed all other operations. Had the transportation companies and smelters been able to handle the ore, however, many of the smaller copper mines would have made a much greater output. It is estimated that about 550,000 tons of copper ore was hoisted in 1916.

TIN.

About 232 tons of stream tin was produced in Alaska in 1916. Of this about 162 tons came from the York district, where two tin dredges were operated and a third was working on placer ground carrying both tin and gold. Developments were also continued on the Lost River lode-tin mine. The rest of the concentrates were recovered incidentally to placer-gold mining in the Hot Springs district of the lower Tanana Basin.

ANTIMONY.

The mining of antimony ore (stibnite) began in Alaska in 1915 and continued in a small way through the first half of 1916. The fall in the price of antimony during midsummer put an end to most of these operations. About 1460 tons of crude ore was mined and shipped during 1916. Much the larger part of this came from the Fairbanks district.

TUNGSTEN.

Though scheelite has long been known to occur in some of the Alaska placers, up to the last two years the demand for it has not been sufficient to encourage its recovery. The recent high price of tungsten has induced Alaska miners to turn their attention to scheelite deposits. In the fall of 1915 a scheelite-bearing vein was discovered in the Fairbanks district, and its development began. Later two other scheelite-bearing veins were found in the same district. During the winter some of these scheelite ores were treated in a local mill, and the concentrates were shipped out by parcel post. Scheelite mining was continued during the summer, and the crude ore was shipped out by steamer. Considerable scheelite was also recovered from some of the gold placers at Nome, and a little was produced in other districts. It is estimated that about 50 tons of scheelite concentrates were produced in Alaska during 1916, for which the producers received over $50,000.

MINERAL FUELS.

The production of petroleum from the only oil claims patented in Alaska, in the Katalla district, continued in 1916. The operating company was reorganized and more extensive exploitation was undertaken. About 8,000 tons of coal was mined in Alaska during 1916 from half a dozen small mines. The largest producer was the Bluff Point mine, on Cook Inlet, where a lignite bed was exploited for the local market. The mining of coal in the lower end of the Matanuska field, for the use of the Alaska Engineering Commission, was also a significant event. This part of the field is already made accessible by the Government railroad, now under construction. The construction of a private railroad from Bering River into the Bering River coal field was also begun, and a little coal was mined at the southwest end of the Bering River field. Tenders for leases of coal lands in both the Bering River and Matanuska coal fields under the new law have been received by the Interior Department. Another important event was the completion by the Geological Survey of a detailed examination of the more accessible part of the Nenana coal field, lying about 60 miles south of Fairbanks. All these facts indicate that systematic exploitation of the Alaska coal fields will soon be undertaken.

The figures received by the Federal inspector, as shown under the title "Coal mining in 1916" (p. 8), indicate that the production of coal may be somewhat higher than the estimate above.

WORK OF THE FEDERAL INSPECTOR.

The inspector was called to Washington, D. C., early in the spring for conferences regarding the leasing of coal lands in Alaska and while there completed a report on the leasing units and Government reservation in the Matanuska Valley, the field work for which had been done the previous summer and fall. While in Washington the inspector attended the National Safety-First Exhibit, February 21 to 26, and also the conference of State and Government officials on the standardization of mining statistics and mine regulations.

During the year two reports were prepared on mine inspection and the mining industry in the Territory. The first report, made to the Director of the Bureau of Mines, covered the calendar year 1915.[a] It contained the new laws passed by the Territorial Legislature in regard to mine inspection, descriptions of mines throughout the Territory, lists of operators, tables of accidents, and recommendations for the advancement of the mining industry. The second report, made to the Secretary of the Interior, was for the fiscal year ended June 30, 1916. It reviewed in brief the mining industry and made certain recommendations for improvement, but did not go into the details of mining.

Early in the spring of 1916 the Federal and Territorial inspectors agreed to cover different parts of the Territory to avoid duplication of work and to obtain the greatest efficiency. Accordingly, the Federal inspector began his field work in the districts tributary to Cook Inlet and covered the country from there to Ketchikan. This area embraced the Willow Creek (Susitna drainage), Matanuska, Cache Creek, Crow Creek, Kenai Peninsula, Prince William Sound, Copper River, Juneau, Sitka, and Ketchikan districts. The inspection covered the operations of dredges, mills, metallurgical works, coal, lode and placer mines, the field work occupying most of the time from May to the latter part of December.

Before the Federal inspector returned from Washington, the Territorial inspector visited the districts of southeastern Alaska and went into the interior of the Territory as soon as navigation on the rivers opened. He visited the placer fields tributary to Fairbanks,

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[a] Smith, S. S., The mining industry in Alaska during the calendar year 1915: Bull. 142, Bureau of Mines, 1917, 65 pp.

Tolovana, Hot Springs, Ruby, Iditarod, and the Seward Peninsula. Leaving Nome on one of the last boats in the fall, the Territorial inspector made a trip to the west, visiting the Prince William Sound and Copper River districts.

NEEDS OF THE INSPECTION SERVICE.

HEADQUARTERS.

The headquarters of the Federal inspector are at Juneau, where he occupies, through the courtesy of the Department of Justice, the grand jury room in the courthouse when that body is not in session. However, the district court has ruled that criminal cases coming before the United States commissioner must be tried by jury, and, as the grand jury room is the only room large enough to accomodate the number of persons necessarily present at such trials, it becomes incumbent for the mine inspector to move out whenever a criminal trial is held before the commissioner. This procedure leaves the files and library of the inspector open to any who care to take advantage of the opportunity. Valuable books and bulletins have been removed from the office, or disfigured with pencil notations. The room is entirely inadequate for the present needs of the inspector's office and permanent quarters should be procured at an early date, especially as the opening of the coal mines throughout the Territory will greatly increase the work to be done. The coal mines in the Territory are operated on ground leased from the Federal Government and the duty of inspecting these mines rests on the Government, as the territorial mine inspection act specifically excepts coal mines from the jurisdiction of the territorial inspector.

An appropriation should be made to cover the rental of permanent quarters and provide funds for the purchase of office furniture and supplies. An appropriation of $600 for office rent is recommended.

CLERICAL ASSISTANCE.

During the past year the Federal inspector has been able to keep the records of his office current and to attend promptly to all correspondence through the aid of Roy A. Dye, who was appointed clerk to the mine inspector in the fall of 1915 and has made his headquarters in Juneau. In addition to his office duties Mr. Dye has spent considerable time in training the miners near Juneau in first aid to the injured.

FIELD ASSISTANTS.

It would require a period of at least four years for one man to inspect all the mining operations in the Territory, and while he was spending a season in one district the mines visited the year before in another locality would have ceased to exist and others would have been opened. The Federal mine inspector should have at least four assistants. And even with this number many mining operations in the more remote portions of the Territory could not be visited more than once annually and inspection based on one visit per year certainly can not be considered efficient.

Under present conditions the percentage of serious and fatal accidents that the inspector can investigate is extremely small and, owing to the time consumed in travel and communication, it may be impossible for the inspector when he finally arrives to determine the causes accurately. With the facilities now at hand the inspector can not investigate a tenth of the serious and fatal accidents and it is necessary for him to rely upon the statements of the operators, supplemented by those of employees, for at least nine-tenths of the information regarding the causes of accidents.

The infrequent visits of the inspector work a hardship both on the employee and operator, as the inspector often fails to see the mines under average conditions. To be specific, many of the mines have excellent ventilation in the winter, when conditions for ventilation are most favorable; but in the spring and fall, when atmospheric conditions are changeable and when the temperature outside varies but little from that underground, the relative humidity becomes so high and the air so contaminated that it is impossible for men to accomplish more than a small part of their normal work. If a mine is visited at this time the ventilation is condemned, whereas if the inspector had gone through the same mine a few months before he would have found the ventilation excellent.

The Federal mine inspector should have assistants enough to inspect thoroughly every mine of any consequence several times during the year and to investigate practically all the serious and fatal accidents. The visits should be so frequent that the inspectors would see all the mines under average rather than under exceptional conditions.

Many of the coal beds in the Bering River and Matanuska fields are extremely gaseous and great caution should be used in opening mines, whether under lease or free-use 10-acre permits. The inspector's office should be equipped with sufficient mine-rescue apparatus in each coal field to train the miners in its use and provide against the emergency of an explosion until the operators in the fields have sufficient apparatus and trained men to insure prompt action in case of accident.

MINE EXPERIMENT STATIONS.

Alaska has been particularly fortunate in having mine experiment stations, under the Federal Bureau of Mines, established at points that will serve both the coast and the interior districts. The station at Fairbanks will be able to handle such problems as may arise in the interior, and work along the coast will naturally go to the Seattle station. The Alaskan problems presented to these stations will be numerous, but particular attention will be given those that confront the pioneer. The metallurgy of the copper-bearing magnetites of the Ketchikan district, the development of electric smelting to utilize the vast water power available along the coast, the concentration of tungsten minerals, the metallurgy of tin ores, the economic recovery of minerals other than gold from placer gravels, the cleaning and coking of the bituminous coals with attendant by-product problems, the possibility of briquetting the lower-grade lignites, and a general dissemination of knowledge concerning the value and occurrence of many of the rarer minerals are only a few of the questions that will arise immediately. An effort to assist the prospector will do more to develop the Territory at this particular time than any other line of endeavor.

COAL MINING IN 1916.

The most important event in the Alaskan coal industry in 1916 was the announcement by the Government of the reservations and leasing units in the Matanuska and Bering River coal fields and the promulgation of rules and regulations governing the operations of mines under the coal-leasing act. Already a number of bids have been received, ranging up to $2,000,000. These have been advertised in various periodicals and newspapers for the required period and the proper length of time has been given for competitive bidders to place their final statements. Owing to the time necessary for this work, it has been impossible to start active development on any of the leases this year, so the only coal development has been on patented areas and on the free-use 10-acre permits issued by the Government.

The Alaskan Engineering Commission has completed the Government railroad to the central part of the Matanuska coal field, and private interests have undertaken the construction of a standard-gage road from a point known as Goose City, on Controller Bay, to the Bering River field.

The free-use 10-acre permits, which apply to all coal land outside the surveyed areas in the Bering River and Matanuska coal fields, have been freely used to supply coal for local needs, and except for the clause restricting shipments to local points some coal would have been shipped to the States from areas held under them. The permits provide that the applicant may begin mining coal as soon as he has mailed his application for the permit and may continue work for two years unless his application is denied by the General Land Office.

Under these conditions William Martin made application in the early spring to mine coal on Moose Creek, in the Matanuska field. Before he could be advised that this area constituted a part of one of the leasing units his foreman had driven a short drift and taken out about 100 tons of coal, which was hauled to the Willow Creek district, about 20 miles, and used for domestic purposes in the camp of the Alaska Free Gold Mining Co., which is under lease to Mr. Martin. Later a contract was let to Oliver La Duke to supply the Alaskan Engineering Commission with 1,000 tons of coal. His men entered the workings made by Mr. Martin's foreman and stoped the coal to the surface, leaving the ground in exceedingly poor shape for anyone who should lease it at any future date.

Later R. G. Doherty was given a contract to supply the commission with 2,000 tons of coal. Mr. Doherty, who had discovered a coal bed on the west bank of lower Moose Creek, about a mile above the railroad right of way, opened a mine described elsewhere in this report, and later received a free-use 10-acre permit covering the ground, in order that he might mine and sell to the local trade. This ground, although within the surveyed area in the Matanuska field, was not a part of any of the leasing units, and so did not conflict with the areas offered for lease. Under a second contract Mr. Doherty furnished the commission with several thousand tons and shipped about 300 tons to the various towns for local consumption, making a total for the year of approximately 6,000 tons.

The producer ranking next in point of tonnage was John A. Herbert, who obtained a permit to mine coal near Bluff Point, about 14 miles north of Seldovia, on Cook Inlet. Here a 6-foot seam of lignite, dipping approximately 8°, was opened by a drift on the bed and an air shaft for ventilation. Both walls are sandstone. The coal is fairly clean and a good domestic fuel. The property is nongaseous, and only eight men have been employed underground. The coal was shipped to Anchorage, Seward, and Seldovia, the total output being 1,500 tons.

The Happy Valley Coal Co., also operating near Bluff Point, made a small output, which was shipped to Anchorage. The company applied for a lease that it might ship coal to the States.

The Cache Creek Dredging Co. obtained a permit to mine coal on an area near its dredging ground, on Cache Creek, in the Yetna Valley, and mined about 20 tons of coal a day during the dredging season. The coal was used at the camp on the dredge. Most of this coal was taken from an open cut, but a contract has been let to drive entries and an air shaft this winter, so that a supply of better coal will be available nearer the dredge early in the spring.

A small amount of work was done by Harry Dugdale, on the patented ground of T. P. MacDonald, in the Bering River field, and operations were resumed by the Alaska Petroleum & Coal Co. at its patented ground on Canyon Creek. Each of these areas contains 160 acres.

As the ground covered by permits is widely scattered and mining is intermittent, an accurate return on the amount of coal mined during the year is not possible, but probably the total production approximated 10,000 tons. No coke was manufactured nor was any coal shipped out of the Territory.

The following table shows the scattered areas covered by the free-use 10-acre permits:

Ten-acre permits for mining coal.

Operator.	Locality.
Raymond W. Silver	South shore of Knik Arm, on Cook Inlet.
I. D. Nordyke	Kachemak Bay, Cook Inlet.
Stimson & Heffner	Eight miles north of Susitna.
Ralph V. Anderson	Kachemak Bay, Cook Inlet.
George A. Esterbrook	Chicken Creek, Forty Mile.
Robert Brown	Watershed between Koyuk and Kewalic Rivers (north of Nome).
George Wallin	Kugruk River between Montana and Reindeer Creeks (north of Nome).
George F. Hendricks	Kootznahoo Inlet, Admiralty Island.
Cache Creek Dredging Co	Cache Creek, Yetna Valley.
John A. Herbert	Bluff Point, Cook Inlet.
Frank Wells, A. O. Wells, and John Coffey.	Coal Creek, Chulitna Valley.
Wm. Knox and Chas. Krutsinger	Iditarod.
J. R. Uhl	Eight miles north of Anchor Point, Cook Inlet.
R. G. Doherty	Moose Creek, Matanuska Valley.
Fredrick Brassell	Lower end Matanuska field, just outside surveyed area.
Robert M. Aistrop	Shore, Cook Inlet, 24 miles south of Kaisilof River.
William Maitland and S. L. McLennan.	Carpenter Creek, Matanuska field, south of surveyed area.

GOVERNMENT RAILROAD.

The past season has been a busy one for the Alaska Engineering Commission which is building the Government railroad from the coast to the interior. The docks at Seward were rebuilt after being destroyed by fire during the spring, and the old line of the Alaska Northern has been rehabilitated, so that it is possible to get trains to Kern Creek although there still remains much bridge building and trestle work to be completed on this end of the line. Rails have been laid about 15 miles southeast of Anchorage to Potter Creek, on Turnagain Arm, and a number of crews have been employed the past winter on rock work between this point and Kern Creek. Track has been laid to the central part of the Matanuska field and will now be advanced along the main line or by spurs, according to the greatest needs of the coal operators. From Matanuska Junction some 30 or 40 miles of track have been laid along the main line, and in the Susitna Valley between Montana Creek and Indian River over 70 per cent of the right of way has been cleared. The work at Nenana has proceeded up the Nenana to unite with the line coming up the Susitna at Broad Pass and up the Tanana toward Fairbanks. During the active part of the season the commission employed approximately 5,000 men. Coal has been shipped from Moose Creek to Anchorage, the freight rate being 75 cents a ton in carload lots. The passenger rate is 6 cents a mile.

ROAD AND TRAIL BUILDING.

In a pioneer country the maintenance of existing roads, the prompt building of trails to newly discovered districts, and the conversion of these trails into roads as the districts advance are of the utmost importance. There are three sources of revenue for the construction and maintenance of roadways throughout the Territory: First, the appropriation made by Congress to be expended under the direction of the Alaska Road Commission, which is managed by engineers from the United States Army; second, 65 per cent of the Alaska fund, composed of the revenues derived by the Federal Government from business and trade licenses outside of the incorporated towns; and, third, 75 per cent of the moneys which the Territory derives from the sale of timber on the National Forest Reserves. All told, these sums are usually less than $250,000 per annum and are inadequate for a Territory as large as Alaska.

LABOR.

As a whole the supply of labor has not been adequate, especially during the late summer and fall. In the spring there was a slight excess of labor at the localities where railroad building was most active, but this was soon absorbed by the construction work. The high wages paid to miners in the States made serious inroads on the labor supply along the coast where the wages are comparatively low. Many properties were short-handed and the type of labor available was far from satisfactory.

Wages in Alaska are low in view of the cost of living and the short season of the interior. Machine men are paid $3.50 to $4 an 8-hour shift along the coast, the cost of board usually amounting to $1 or $1.25 a day, with extra fees for room, medical attention, etc.

Throughout the interior and on Seward Peninsula the average wage is $5 per day and board, the hours varying somewhat in the different districts, though most of the underground work is on an 8-hour basis. In the interior, board is figured at $2 to $2.50 per day and on the Seward Peninsula at $1.25 to $1.50 per day. As most of the placer mines operate less than six months of the year, and as the wages then earned must be averaged against a long period of inactivity, $5 a day and board is poor remuneration.

FIRST-AID AND MINE RESCUE TRAINING.

First-aid and mine rescue training represent a difficult problem for the mine inspector's office. The actual work of inspection is so much greater than what one man can accomplish that little time is left for giving men this much-needed training. During the stormy season in the winter, when travel is difficult, the inspector has utilized as much time as possible in assisting in training the miners of the Juneau district in mine rescue and first-aid work.

The following report of the first-aid contest on July 4, 1916, is taken from The Gold Bar, the official safety magazine of the Alaska Treadwell Gold Mines Co.:

> At 8 o'clock the next morning (July 4) the second annual first-aid contest was held on Treadwell Field, with entries from the Treadwell, Mexican, Ready Bullion, and Alaska-Juneau mines. The contest was judged by Drs. Sloane, of Juneau; Sargent, of Douglas; Midford and Ellis, of Treadwell. The two-man and two-team events were given. First place was won by Alaska-Juneau, under the leadership of Capt. Monte Benson, with a score of 99 per cent. Treadwell, captained by C. R. Horner, and the Ready Bullion, captained by John Olsen, tied for second place, both scoring 96½ per cent. The Mexican, captained by Charles Hall, was close in their wake with 95½ per cent. All the teams are to be complimented on their excellent work, especially as each score sheet bore this legend: "When in doubt, dock."

Aside from its humane aspects, first aid has amply demonstrated its cash value in this district. To state accurately the amount of this saving is impossible, as no one can determine the time an injured man would have spent in the hospital had he not received first-aid treatment. As the Territorial act directs that the compensation paid by the employer varies directly with the length of time the injured man is incapacitated, it is greatly to the advantage of the employer to see that the latter is given the best of treatment.

The Territorial act fixes the employer's liability for fatal accidents to married men at $3,000 and $6,000, the amount varying with the number of dependents. On this basis the saving of one life represents a minimum saving of $3,000. The records show that recently several men overcome by powder fumes have had their lives saved by the prompt application of artificial respiration. During the past five years the application of artificial respiration has saved the district immediately tributary to Juneau at least $50,000 in direct sums.

Had these men died the community would have suffered an economic loss, and the operators would have had to pay out large sums in compensation.

The need of mine rescue apparatus and training may not be so apparent to the casual observer as the need of training in first aid. However, in the low-grade gold mines of the Juneau district poor ventilation in the long raises has been responsible for many deaths that might have been prevented by the proper use of self-contained breathing apparatus. As a specific example, the accident to Ole Roen (Table 1, p. 62) in the Alaska-Juneau mine, on September 6, 1916, may be cited. Roen was working for a contractor who was driving several inclined raises, and with his partner, Ernest Larson, went on shift shortly after 7 o'clock in the evening. The compressed-air pipe, the only means of ventilating the raise, was blocked by some dirt in the nozzle, and the raise was full of powder gases from the blasting of a previous shift. When the partners were about 160 feet up the raise the air became so bad that they turned back, but Roen became unconscious when he reached the 100-foot point and slid onto the footwall with his feet against the ladder. Larson reached the foot of the raise and notified several men, who tried again and again to reach the unconscious man. Their efforts were successful after three of them had been overcome by gas, one falling into the waste pocket and injuring his hip. All the unconscious men were given artificial respiration, but Roen had been in the gas too long and never regained consciousness. The total result of this accident was one man killed, one in the hospital with an injured hip and suffering from the effects of gas, two others in the hospital suffering from the effects of the gas, and a temporarily disorganized crew. All this could have been prevented by a properly-trained man wearing breathing apparatus. The financial loss in this one accident would have more than covered the cost of equipping the mine with such apparatus.

At practically all of the large mines throughout the Territory competent physicians are employed, and at some, notably the Alaska Treadwell, an effort has been made to drill the men in first-aid methods. These attempts, however sincere, are more or less spasmodic.

MERIT RATING FOR MINE INSURANCE.

For several years the companies operating the large low-grade gold mines of the coast have enjoyed a particularly favorable insurance rate ($2.75 per $100 pay roll) in spite of the fact that the Territorial compensation is larger than the average paid in the States. At the close of 1916 two of the largest mines had their insurance withdrawn by the insurance companies on account of the number of accidents, and were offered new insurance at a rate that would have increased their premiums nearly $50,000 annually. It is not possible to say that the original rate could have been retained, but the higher rate represents a material loss to the stockholders. Had the men been carefully trained in first aid, had the mines been equipped with rescue apparatus, and had a competent safety engineer been empowered to carry out a comprehensive plan of accident prevention, it is probable that the corporations would still be enjoying a favorable insurance rate.

The merit rating of mines for insurance rates has been adopted in the larger mining centers of the East, arrangements are being perfected for its introduction in California, and, sooner or later, it is bound to come to Alaska. The accident ratio in Alaska is fairly high and there is no reason why it can not be materially reduced if the operators give more attention to the study of accidents. A careful investigation of all accidents would soon lead to measures for their prevention and automatically reduce the rate to a point where the corporations would be warranted in applying for more favorable insurance rates.

COST DATA.

Conditions in the Territory are so variable that mining costs have a wide range. The different items vary with the seasons, and in order to reduce costs to the minimum the outlay for mining and for the transportation of supplies must be spread over a period of years in order to take advantage of climatic conditions.

The record for low costs for lode mining in the Territory is held by the Alaska Gold Mines Co., its annual report giving $0.69039 a ton as the total cost of mining and milling. These figures are possible only at a property favorably situated with regard to transportation and labor conditions and handling an extremely large tonnage. At several of the best-managed lode mines in the Fairbanks district the costs range between $15 and $20 per ton.

In estimating costs in placer mining the customary unit of measurement is the square foot of bedrock cleaned. On the Seward Peninsula the cost of working the drift mines in frozen ground ranges upward from 35 cents a square foot of bedrock, according to the nature of the ground and the location of the claim. Near Fairbanks it is somewhat higher. On a claim typical of the deep ground of that district, the cost, including overhead expense, amounted to 90 cents a square foot. Here the bedrock was a comparatively soft schist, the ground was frozen, the gravel of medium size with no large bowlders, and the depth about 180 feet. In working the ground about 1½ feet of bedrock was taken up and 3 or 4 feet of gravel was mined.

About the same conditions govern dredging costs, though much depends on whether the gravel is frozen or not, and in frozen ground the cost may vary considerably because of careful or careless thawing. On the Seward Peninsula, where crude oil is available for fuel, thawing costs 12½ to 15 cents a cubic yard. In the Iditarod, where wood is used for fuel, thawing costs may range from 37½ to 60 cents a cubic yard. The cost of dredging, including amortization and depreciation but not including thawing, for the entire Territory will probably average approximately 25 cents a cubic yard or more.

To insure maximum efficiency in handling frozen ground the thawing points should be carefully placed with regard to the kind of material to be thawed. Also the thawed ground should be allowed to stand a month or two before the dredge reaches it to assure the full benefit of the heat.

The principal items of cost are labor, food, fuel and freight. Miners in southeastern and southwestern Alaska receive $3.50 to $4.50 a day; in the interior and on the Seward Peninsula, $5 a day and board. The costs of boarding men in southeastern and southwestern Alaska is figured at $1 to $1.25 per day; on the Seward Peninsula, at $1.25 to $1.50; and in the interior, at $2 to $2.50; but it necessarily varies with the size of the crew.

In southeastern Alaska, companies buying comparatively large lots of fuel pay about $6 per ton (2,000 pounds) for coal and $1 a barrel for oil at tidewater; on Prince William Sound, $9 a ton for coal and $2 a barrel for oil; at Nome, $15 a ton for coal and $2.50 a barrel for oil; at Fairbanks wood is $12 to $16 a cord delivered. Such prices will undoubtedly be materially lower when the Government railroad is completed and coal and oil from Alaskan fields are available.

In the following tables of freight rates, 2,000 pounds or 40 cubic feet are considered a ton. It is the practice to charge by weight or by bulk, according to which basis will yield the greater profit to the carrying company. On extra heavy pieces an excess charge is made. Full details of local freight rates can not be given because of variations at different places and in different seasons, but the following tables indicate the rates to the larger centers:

Freight rates, per ton, from San Francisco, Seattle, or Tacoma.

[Ton=2,000 pounds or 40 cubic feet.]

Destination.	General rate.	Coal.	Mining machinery.[a]	High explosives.
Andreafski	$28.00	General rate.	General rate.	General rate plus 100 per cent.
Marshall	30.00	do	do	Do.
Dikeman	50.00	do	do	Do.
Ruby	42.00	do	do	Do.
Fairbanks	55.00	do	do	Do.
Rampart	50.00	do	do	Do.
Circle	55.00	do	do	Do.
Eagle	57.00	do	do	Do.
Bettles	80.00	do	do	Do.

[a] Extra charge for pieces weighing over 2,000 pounds.

Freight rates, per ton, for carload lots, from Seattle or Tacoma.

[Ton=2,000 pounds or 40 cubic feet.]

Destination.	General rate.	Coal.	Mining machinery.[a]	High explosives.
Nome	$15.50	$12.00	$15.00	$32.00
St. Michael	15.50	12.00	15.00	32.00
Golovin [b]	16.50	8.50	10.00	27.00
Teller [b]	12.50	9.50	12.50	32.00
Deering [b]	14.00	9.00	13.00	35.00

[a] No single piece weighing over 3,999 pounds, per ton, weight or measure.
[b] Does not include lighterage.

Freight rates, per ton, from Seattle or Tacoma.

[Ton=2,000 pounds or 40 cubic feet.]

Destination.	General merchandise.	Coal.	Machinery.[a]	High explosives.
Ketchikan	$6.50	[b] $3.00	$6.50	$12.00
Sulzer	9.50	[b] 4.00	9.50	22.00
Wrangel	7.50	[b] 3.00	7.50	17.00
Petersburg				
Douglas				
Juneau				
Treadwell				
Skagway	8.50	[b] 3.50	8.50	22.00
Sitka	10.00	[b] 4.00	10.00	22.50
Katalla Anchorage [c]	12.50	[d] 7.00	12.50	20.50
Ellamar				
Cordova				
Latouche				
Valdez				
Seward				
Seldovia	14.00	[d] 8.00	14.00	23.00
Knik Anchorage [c]	14.50	[d] 8.00	14.50	23.00
Illiammia Bay	17.50	[d] 10.00	17.50	35.50
Kodiak	16.50	[d] 9.00	16.50	30.50
Appollo	16.50	[d] 11.00	17.50	37.50

[a] Extra charge for pieces over 4,000 pounds.
[b] In bulk on freight boats at owner's risk.
[c] Does not include lighterage.
[d] In sacks.

MINES AND DISTRICTS.

SOUTHEASTERN ALASKA.

JUNEAU DISTRICT.

ADMIRALTY ALASKA GOLD MINING CO.

The company is developing a group of 52 lode claims on the south shore of Funter Bay, on Admiralty Island. As the claims had been worked previously by several organizations considerable work was done at scattered points. Several crosscuts have been driven to tap the ore bodies and a shaft sunk 110 feet. From one crosscut drifts were run for about 150 feet on the ore and the vein stoped to surface, approximately 75 feet. The ore was crushed in two Fulton five-stamp batteries.

The mill has been rehabilitated and the company plans to develop the known ore bodies and to drive a crosscut at the base of the hill to tap several veins exposed on the surface.

ALASKA GOLD MINES CO.

The Alaska Gastineau Mining Co., which works the Perseverance mine in Silver Bow Basin, about 4 miles from Juneau, is the operating company for the Alaska Gold Mines Co. The ore is in an enormous fissured zone of slate and metagabbro cemented by a network of quartz lenses and veinlets. The mine was first opened by what was known as the Gilbert workings, the present fifth level, and later by a 1,400-foot crosscut, known as the Alexander crosscut, approximately 1,000 feet below the Gilbert workings. When the Alaska Gold Mines Co. assumed control plans were made for extensive development. The shaft, with stations at every 200 feet, was sunk from the Alexander crosscut to the thirteenth level, and the development of the previously opened levels (200 feet apart) between the Alexander crosscut and the Gilbert workings continued. A 12,000-foot tunnel was driven from Sheep Creek to connect with the bottom of the shaft and a system of oreways, raises, and stopes driven to permit the rapid handling of an enormous tonnage.

The stopes are worked on a full-breast shrinkage system, just enough ore being drawn to give headroom for the machines. Pillars are left at varying intervals. The ore is cut out along the footwall of the stope and caves from there to the hanging wall with little additional blasting. From the stopes the ore passes over grizzlies into the chutes, the oversize being "bulldozed" in bulldoze chambers. From the stope chutes the ore runs into 4-ton cars, of the Granby self-dumping type, which storage-battery motors haul to the main oreways. From the oreways the ore goes on 10-ton cars, hauled by electric motors, to the mill 6,000 feet from the portal of the tunnel.

The mill was designed to treat 6,000 tons of ore a day, but is capable of handling 25 to 50 per cent more. The cars are dumped four at a time by a revolving tipple, the oversize from the grizzlies going through gyratory and jaw crushers to unite with the undersize in a 10,000-ton storage bin cut in solid rock. From this bin a belt conveyor takes the ore to the mill and a second conveyor distributes it to the ore bins. From the bins the ore passes to large rolls and impact screens, the oversize being returned by automatic self-dumping skips to the first set of mill bins and the undersize passing to a second set of bins to be drawn into smaller rolls and impact screens, also set in a closed circuit. The dry pulp from the last bins is concentrated on double-deck Garfield tables, reground in tube mills and passed to Wilfley tables, the concentrate going to the retreatment plant. One of the noteworthy features of the mill is the independence of each unit, the bins being so arranged that the stoppage of one part of the mill does not affect another until the bins in between are empty.

Power for the mine and mill is obtained from several sources. At the mine a small hydroelectric plant is driven by the water of Gold and Survey Creeks, and a large reservoir and hydroelectric plant have been constructed on Salmon Creek, about 4 miles from Juneau. The dam is of a radial arch type, 165 feet in height and 720 feet in length along the crest. The reservoir permits the delivery of 6,000 hp. the year around. Another plant, now under construction on Annex Creek, a tributary of Taku Inlet, will have an initial capacity of 4,000 and an ultimate capacity of 12,000 hp.

ALASKA GOLD BELT MINING CO.

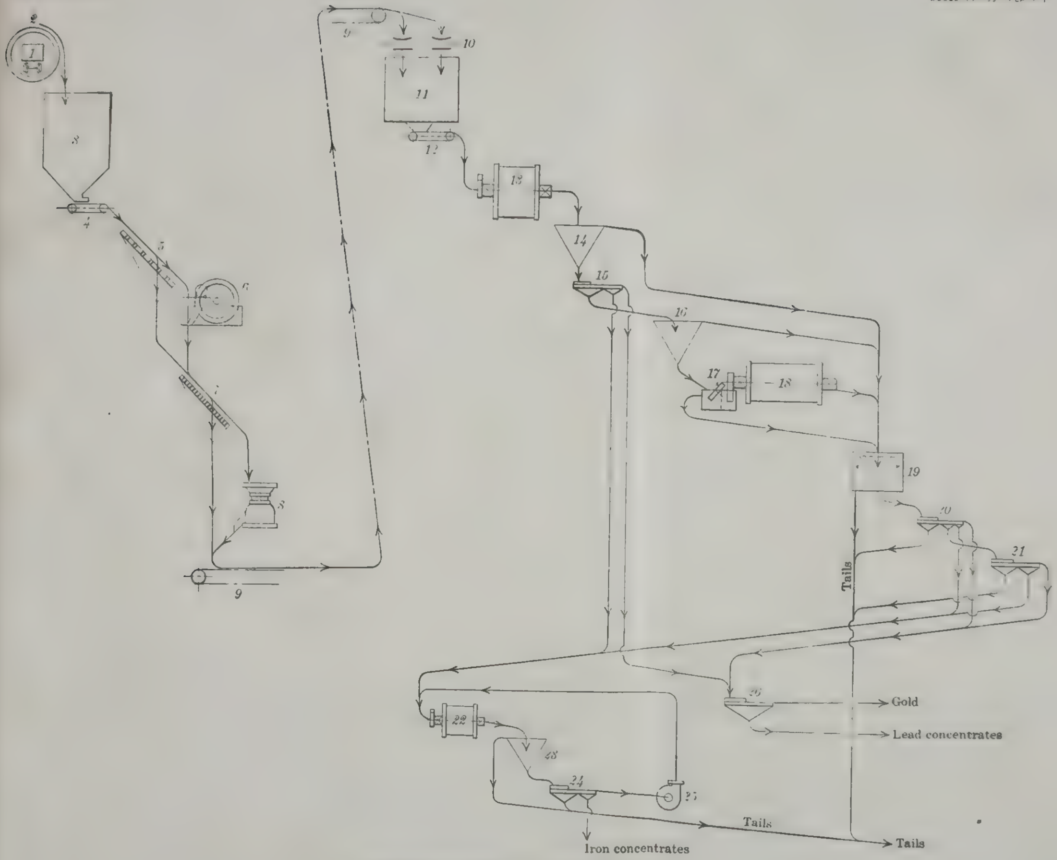
The company is developing the Nelson-Lott group of claims, at the head of Sheep Creek Basin, about 5 miles southeast of Juneau.

ALASKA JUNEAU GOLD MINING CO.

The Alaska Juneau mine is in Silver Bow Basin, about 2 miles from Juneau, and is under the same management as the Treadwell mines on Douglas Island. The ground embraces 29 patented and 88 unpatented lode claims as well as 24 mill sites.

The ore lies in a shear or fracture zone that forms an unusually broad lode but is cut by the Silver Bow fault so as to make two main ore bodies, known locally as the north and the south. The shear zone passes through slate and metagabbro and is traversed by a network of quartz lenses and stringers; its average commercial width is about 400 feet, but its limits have not been determined. It strikes N. 50° W. and dips 60° NE. The strike of the Silver Bow fault is N. 80° E., the dip 70° NW., and the throw approximately 2,000 feet.

In early development work the ore was mined in a glory hole on the side of the mountain, drawn through an adit below and treated in a 30-stamp mill that could run only a short time in summer months, because of the amount of snow in the pit and the scarcity of water. When the grade of the ore proved to be satisfactory, the Gold Creek tunnel was driven to tap both ore bodies and connections were made with the surface; subsequent development was from these openings. This tunnel with its branches constitutes the main haulage way, and is designated as the fourth level, its portal having an elevation of 450 feet. From the portal, a tram, which passes through several short tunnels, has been constructed along the hillside above Juneau and the ore from the development is treated in a pilot mill just south of the city. In 1916 contracts were let for a mill with a capacity of 6,000 to 8,000 tons in 24 hours. This mill, on a site adjacent to the pilot plant, will be completed early in 1917.



PROPOSED FLOW SHEET OF ALASKA JUNEAU MILL.

The south ore body is opened by the No. 1 raise from the fourth level with the third and second levels above, the difference in elevation between levels being 250 feet. The raise starts 6,600 feet from the portal of the tunnel, is 760 feet long, and is driven upward on a slope of 50°. On No. 2 level drifts and crosscuts have been run to explore the ore body and connections are made with the surface. A little stoping has been in progress, but for the present the bulk of the mill feed from the south ore body will come from the glory hole on the surface. The ore ways extend from the cut to the fourth level with bulldozing chambers under the pit, where all large pieces of rock will be broken before they enter the main chutes.

On the north ore body No. 2 raise was driven from the fourth level and connection made to the surface by a 350-foot adit. From this raise the intermediate third, second, first, 0, and 00 levels have been driven. The raise, 8 by 14 feet in the clear with two compartments, is 1,520 feet long and slopes upward 56°. The main levels are all 250 feet apart vertically, the intermediate being 50 feet above the fourth. On the second, third, intermediate, and fourth levels drifts have been driven roughly paralleling the fault and from 100 to 150 feet apart. On the fourth level are chutes with bulldozing chambers at the top every 42 feet to the intermediate; from the chutes are openings into the main stope which is approximately 240 feet wide and 800 feet long. These chutes are fitted with 6-foot arc gates and will be covered with heavy grizzlies to prevent large slabs from falling in and blocking them. Above the intermediate level are raises approximately 100 feet apart and roughly parallel to the Silver Bow fault and the footwall that extend to the third and second levels. From these raises are driven the powder drifts, 30 to 50 feet long and differing about 30 feet in elevation. Several of these drifts just above the intermediate level have been shot with excellent results, and unless some unforeseen difficulty appears, this method of breaking the ore will be used to the surface.

Direct current at 550 volts is used for all electric haulage. At present this current is purchased, but an oil-burning steam plant under construction on the beach will soon be ready to deliver current. The distance from the portal of the Gold Creek tunnel to the mill is 6,200 feet and the trains over the main line will be made up of thirty or forty 12-ton cars. A 30-inch track gage is used, with 50-pound rails on the main and 40-pound rails on the branch lines. The haulage motors comprise three 9-ton General Electric, one 5½-ton Jeffrey, two 18-ton Westinghouse, each made up of two 9-ton articulated units, and two 5½-ton storage-battery locomotives.

Plate I shows the flow sheet of the 8,000-ton mill now under construction. This flow sheet, of course, will be subject to any modifications that may be demanded when crushing begins.

ALASKA PEERLESS GOLD MINING CO.

The company is opening a group of three lode claims, about 2 miles from the beach at Windham Bay. The ore, which strikes S. 70° E. and dips approximately 67° SW., has been opened by two tunnels, one 70 and one 175 feet long. The company plans to put in an air compressor and a power plant this spring.

ALASKA TREADWELL GOLD MINING CO.

The Treadwell group of mines is situated on the northeast side of Douglas Island, across Gastineau Channel, and about 2½ miles southeast from Juneau. The group consists of four mines—the Treadwell, the Seven Hundred, Mexican, and, after a 2,000-foot interval, the Ready Bullion. The four mines are operated by three separate companies, but steps have been taken toward the consolidation of the different groups under one corporation and they may be considered as one enterprise. The Alaska Treadwell Gold Mining Co. operates the Treadwell mine, the Alaska Mexican Gold Mining Co. the Mexican mine, and the Alaska United Gold Mining Co. the Ready Bullion and Seven Hundred mines.

The ore on Douglas Island is in two distinct dikes of albite-diorite, a deep-seated intrusive rock related to the granites, that form the backbone of the coast range of mountains.

This rock has been considerably altered and is traversed by a network of quartz lenses and stringers. The dikes have a hanging wall of metagabbro, also called greenstone, and a footwall of black slate. The ore, which contains occasional horses of schist, has a general strike of N. 60° W. and an average dip of 60° NE. The larger of the two dikes forms the ore body of the Treadwell, Seven Hundred, and Mexican mines; the smaller, about 2,000 feet southeast of the Treadwell-Mexican dike, furnishes that of the Ready Bullion. Along the Treadwell dike the ore is 40 to 400 feet wide and along the Ready Bullion 90 to 270 feet.

At first the ore was blasted into glory holes, drawn out on levels below, hoisted to the surface, and sent to the mills. The varying width of the ore bodies necessitated resort to underground mining at different depths, so that the levels in the different properties were not driven at like elevations, but below the 750-foot level the Treadwell, Seven Hundred, and Mexican constitute practically one mine. A long drift on the 1,100-foot level connects these properties with the workings of the Ready Bullion. The Treadwell, Seven Hundred, and Mexican properties have been opened by vertical shafts with levels at intervals varying from 110 to 200 feet.

The Seven Hundred shaft, after being enlarged to 4 compartments 7 feet 2 inches by 22 feet in the clear, to the 2,700-foot level, was renamed the Central shaft and a new hoist and coarse-crushing plant erected. During the past year the work of enlarging and sinking the Mexican shaft, which will be known as the Combination, began. This shaft, when completed, will be 7 feet 8 inches by 31 feet 4 inches over the timbers and have five compartments. From the Central shaft drifts have been started on the 2,500 and 2,700 foot levels, the lowest developed level at present being the 2,300-foot. From the 1,750 to a point below the 1,950-foot level is a lean streak in the ore body, and a 300-foot floor pillar has been left from the 1,750-foot level to the backs of the stopes on the 2,100-foot level. The only openings between these levels are the raises for ventilation. At the Ready Bullion a new 4-compartment shaft, driven upward at an angle of 70° from the 2,400-foot level, will not only save long crosscuts on the different levels but will facilitate hoisting and ventilation. Levels in the part of the mine now worked are all 200 feet apart vertically.

Mining is by tne shrinkage system, or back-stoping in ore-filled stopes. Levels are driven from the shafts at intervals of about 200 feet vertically, and sublevels are driven 25 feet above. Bulldozing chambers are opened along the sublevels and the stopes the full width of the ore and from 60 to 100 feet wide are cut 25-foot pillars, in which the manways are driven between levels, being left between stopes. Chute raises are driven from the main to the sublevels; through the latter enough ore is drawn to keep the ore about 7 feet from the back. In the bulldozing chambers on the sublevels all the larger slabs are blasted for easy handling in the cars on the main levels. After a stope is finished the ore is drawn and the pillars allowed to cave. The ore is trammed from the chutes to pockets at the shaft in two-ton cars, hauled by horses, storage-battery locomotives, gasoline locomotives, or tail-rope systems. From the pockets at the several shafts the ore runs into skips; then it is hoisted to the surface, is dumped automatically over grizzlies, passes through gyratory crushers to ore bins, and goes thence to the various mills.

The fine-crushing plant consists of five mills with a total of 960 stamps, and has a capacity of approximately 5,000 tons of ore in 24 hours. The crushed ore is concentrated on Frue vanners, all amalgamation plates having been removed during the past year. The concentrates, about 100 tons a day, are treated in the cyanide plant which contains the bullion refinery. The ore fed to the stamps is ground to pass a 3-inch ring and is crushed to 20 mesh before going to the vanners. The stamps weigh 1,240 pounds, fall 100 times per minute, and drop 9 inches. At the cyanide plant the treatment comprises regrinding in cyanide solution in tube mills, agitation in

Pachuca tanks, filtering, precipitating the gold in filter presses, and refining the bullion.

Power is obtained from four sources. The original and cheapest source is water power from impulse wheels at the various mills and compressors. This water is collected on Douglas Island by a system of dams, canals, ditches and pipe lines, extending from Fish Creek, 14 miles northwest of Treadwell, to Ready Bullion Creek, 3 miles southeast. During the wet season the supply is over 4,000 horsepower. In 1910 the policy of electrifying the power system was begun and as a result the Sheep Creek hydroelectric plant, a floodwater plant having a capacity of 2,500 kilowatts, and the Nugget Creek plant, having a capacity of 3,000 kilowatts, were constructed. These plants are on the mainland, the Sheep Creek plant being 4 miles southeast of Juneau, and the Nugget Creek plant, at the foot of Mendenhall Glacier, 12 miles northwest of Juneau.

The fourth source is steam-generated electric power from a central power plant at Treadwell. This plant contains four generators, each directly connected to a steam turbine, running at 3,600 r. p. m. This plant is used when the power supply from the hydroelectric plants fails and has a capacity, when the power is taken at Treadwell, equal to both hydroelectric plants. Direct steam power is being eliminated wherever possible about the mines and mills. California crude oil is used under all boilers for generating steam power or heat. The oil is brought north in tank ships and is stored in eight tanks at Treadwell, which have a capacity of 180,000 barrels. The annual consumption of oil is a little more than 200,000 barrels.

Under the general supervision of the company, an association, known as the Treadwell Club, is maintained for the recreation of the men. A building 56 feet wide by 206 feet long contains a reading room supplied with newspapers and magazines from all over the world, a pool and billiard room, cigar and candy stand, bowling alleys, an auditorium with a seating capacity of 500, and lavatories. In addition there are a natatorium containing a swimming pool 30 by 70 feet, tub, shower, and steam baths, and an athletic field, tennis and handball courts. The dues of $1 a month entitle the members to all the privileges of the club and free admission to the entertainments.

ALASKA TREASURE MINE.

Only assessment work was done during the year at this lode gold mine, locally known as the Nevada Creek property, on Douglas Island, about 3 miles southeast of Treadwell. In the early development a 20-stamp mill was built near the outcrop, but five of the stamps have been moved near the beach, where a long crosscut has been driven to the ore, and it is planned to use the five stamps to sample the ore on a large scale.

EAGLE RIVER MINING CO.

The Eagle River group of 24 lode-gold claims is at Amalga, about 30 miles north of Juneau and 7 miles from tidewater, on the Lynn Canal, to which a horse tramway has been constructed. The ore body consists of quartz lenses and stringers through a shear zone in a slate-graywacke series.

The old workings, consisting of 10 levels from the face of the mountain, have been abandoned, and the only development being done at present is on what is known as the flume level, 600 feet below the former opening. Here the ore has been explored by over 2,700 feet of drifts and crosscuts, and some stoping has been done.

The ore goes to the mill, 400 feet below the flume level, over a balanced tramway. The mill contains twenty 1,250-pound stamps, which drop 7 inches 95 times a minute. The ore is crushed to 20-mesh and passes over amalgamating plates to four Wilfley tables.

EBNER GOLD MINING CO.

Exploration work continues at the Ebner mine, which joins the Alaska Juneau, in Silver Bow Basin. On the main, or No. 0, level over 3,000 feet of crosscuts and drifts were driven during the year, making approximately 13,000 feet of development on that level. A 442-foot raise was completed between the main level and the old workings above.

A testing plant comprises a 5-stamp battery of 800-pound stamps, amalgamating plates, Wilfley table, and regrinding apparatus. Power for the plant and a 12-drill 2-stage Ingersoll-Rand compressor is furnished by a 4-foot Pelton wheel under a 480-foot head.

JUALIN ALASKA MINES CO.

The Jualin Alaska Mines Co. has taken over the options held by the Algunican Development Co. on the Jualin mine and adjoining claims, giving this corporation control of a group of 30 lode claims and a mill site.

Two veins, the north and back ore bodies, have been opened. These strike northeast and dip about 60° NW. The north ore body is 6 inches to 18 feet wide, averaging between 7 and 8 feet. The back vein is 6 inches to 4 feet wide, averaging 3 feet. Both veins have been opened by a crosscut on what is known as the adit level. From this level raises have been driven to the surface and shafts sunk on the ore bodies to the 160 and 310 foot points, from which the development has been carried forward. The ore is mined by overhand stoping, the walls being so strong that only stulls are used in timbering. The gangue is quartz and the country rock a blocky diorite. Two 8 by 10 inch and one 6 by 8 inch geared hoists driven by compressed air are used for hoisting the ore to the adit level. Below the adit level the mine is drained by a 5-inch 3-stage Byron Jackson centrifugal pump, direct connected to a 150-horsepower motor.

At the mill the ore passes over a 1½-inch grizzly, the oversize going to a No. 2 Gates gyratory crusher. From a 50-ton bin it is automatically fed to ten 750-pound stamps, which drop 8 inches 100 times a minute. The screen is varied from 25 to 40 mesh, according to the grade of the ore, and the pulp is run over amalgamating plates to Isabelle vanners. The concentrate is shipped.

A 42-inch Pelton wheel under a 125-foot head supplies power. In winter, as the water diminishes, a 25-horsepower motor belted to the line shafting serves as an auxiliary. Electricity is developed at the main power plant by a 100-kilowatt Westinghouse generator, driven by a Pelton wheel under a 550-foot head. A second Pelton wheel is set directly on a line shafting belted to an Ingersoll-Rand two-stage compressor, with a capacity of 2,500 cubic feet of free air a minute. The power plant is so arranged that two semi-Diesel 150-horsepower engines can be belted to the main line shafting in periods of low water.

KENSINGTON MINING CO.

The company continued to explore its property in the Berners Bay district, about 60 miles northward from Juneau. The new mill, plans for which were formulated last year, was not built.

NORTHERN EXPLORATION CO.

The company is developing, under bond, the Enterprise and Montana groups, each containing five lode claims, on the north shore of Limestone Inlet, about 25 miles south of Juneau.

At the Enterprise group, a drift has been driven 320 feet on the vein at an elevation of 1,300 feet. A 77-foot raise connects this and a second drift, which is in 120 feet on the ore. The vein strikes N. 30° E., dips 52° NW., and averages about 30 inches in width. The country rock is diorite and the gangue quartz. Stopes have been opened on both levels and the ore is conveyed from the mouth of the lower drift to the mill on the beach by a jig-back tram, with a 1-inch track cable, ⅜-inch haulage cable, and two buckets with a capacity of 500 pounds each.

At the mill the ore passes over a 1-inch grizzly to an 8 by 12 inch jaw crusher and is fed from the bins to the stamps by Challenge feeders. The battery is of Frazer & Chalmers design and contains five 1,250-pound stamps falling 6 inches 98 times per minute. Forty-mesh screens are used. The pulp passes over amalgamating plates to concentrating tables.

GRANBY CONSOLIDATED MINING, SMELTING & POWER CO. (LTD.).

The company has been working the Mamie and It mines during the year, besides doing considerable exploration of other claims in the locality.

The Mamie mine, at Hadley, on Lyman anchorage, on the coast of Prince of Wales Island, is opened by a 300-foot shaft and a crosscut which taps the shaft on the second level 170 feet below the collar. There are four levels at intervals of 95, 75, 60, and 65 feet. The ore is chalcopyrite in a silicious and magnetite gangue associated with small amounts of gold and silver. The ore bodies, irregular lenses of greatly varying size, are found in an altered zone between a granodiorite intrusive and limestone and greenstone. One of the lenses measures 5 feet by 20 feet by 20 feet; another 150 feet by 300 feet by 75 feet. These figures give no idea of the size of the magnetite bodies, as the ore has been mined only as far as the copper content made it valuable. The lenses have a north and south strike, approximately parallel to the contact, and are practically vertical. Because of the ore bodies varying in size, no one method of mining is applicable to the whole mine.

Part of the ore near surface was mined through a glory hole; underground some stopes have been worked on a full-breast system and in others the ore has been shot off in benches. All drilling, except that done by contractors, is on the day shift, and the ground blasted at night by a shot firer who handles all the powder. This plan eliminates much of the danger of handling powder and provides much better ventilation than is produced by indiscriminate blasting.

One 60-hp. return tubular and one 90-hp. locomotive type boiler furnish power. The ore is raised with a 12 by 18 inch two-cylinder, double-drum Bradley hoist. Leyner drills and jack hammers are used underground. The ore is conveyed from the mine to the wharf over a 7,200-foot Riblet tram, having a capacity of 300 tons in 9 hours. The diameter of the track cable on the loaded side is 1¼ inches, on the empty side 1 inch; the haulage cable is ¾ inch and the capacity of the buckets 7 cubic feet. There are 13 towers and the upper terminal, elevation 750 feet, has a bunker capacity of 700 tons. The lower bunkers hold 150 tons.

The It mine is situated on Kasaan Bay, about three-quarters of a mile from the beach. The ore is chalcopyrite, but differs from that at the Mamie in being higher grade and having a gangue of altered limestone. It lies in lenses between intrusive granodiorite and limestone. When the company took over the mine there was a 150-foot vertical shaft and a 1,500-foot crosscut, 280 feet below the bottom of the shaft. A 2-compartment raise was driven to the shaft and the ore passed down this to the tunnel level. From the mouth of the tunnel an 8-hp. gasoline motor hauls the ore to the beach, where it is stored in bunkers, having a capacity of 1,200 tons. A large portion of the work this year has been diamond-drill exploration. The company furnishes living quarters at both mines, those at the Mamie being a little better equipped as regards change rooms and showers on account of the greater number of men working there.

JUMBO MINE.

The Jumbo mine, commonly known as the Sulzer, of the Alaska Industrial Co., has been leased the past year to Charles A. Sulzer. It is situated on Hetta Inlet, on the West coast of Prince of Wales Island.

The ore, mainly chalcopyrite, lies in lenses in an altered zone between granite and limestone. These lenses show little continuity and prospecting is difficult. The main entrance to the mine is a crosscut at an elevation of 1,500 feet, though many of the ore bodies have been near enough to surface to be worked as open cuts during the summer. A 252-foot winze has been sunk from the crosscut and several levels, with connections to the surface for ventilation, opened on the ore bodies. A Hallidie hoist raises the ore from the winze to the crosscut level, whence it is trammed to the entrance of the crosscut, and then sorted before going to the bins which constitute the upper terminal of an 8,000-foot aerial tram. The lower terminal is at the 4,000-ton bunkers on tidewater. The track cable has a diameter of 1⅛ inches on the loaded and seven-eighths inch on the empty side; the haulage cable is five-eighths inch.

At the mine a Sullivan compressor, driven by a 60-horsepower Allis-Chalmers motor, furnishes air for the hoist and machines. The power comes from a hydroelectric plant on the beach where a 50-kilowatt General Electric dynamo is belted to a 36-inch Pelton wheel under a 360-foot head.

There is a sawmill on the beach and during the summer two new bunk houses, a superintendent's house, and a number of other buildings have been erected.

A deposit of barytes has been opened by Mr. Sulzer at Lime Point, several miles below Sulzer, and machinery is on the ground for the erection of a grinding plant in the spring of 1917.

MOUNT ANDREW MINING CO.

The Mount Andrew mine is situated 3,600 feet from tide water, on the north shore of Kasaan Bay, on the east coast of Prince of Wales Island.

The ore, chalcopyrite-magnetite lenses of irregular size and shape in an altered zone between a granodiorite and a limestone, is mined for its copper content. Large bodies of low-grade ore opened in the stopes and glory hole will be available for a concentration plant in the future.

The largest opening made to date is 40 feet wide and 230 feet long. Most of the mining has been through glory holes, though a recently completed crosscut about 1,600 feet long and a 310-foot raise tap the ore from below. Recently most of the development work has been confined to the main and a number of outlying ore bodies at the surface.

A 3,800-foot Riblet automatic tram, with a capacity of 300 tons in 8 hours, connects the mine and wharf. There are 16 towers and the buckets have a capacity of 1,100 pounds each. The diameters of the cables are: Loaded side, 1 inch; empty side, three-fourths inch; and haulage cable, five-eighths inch. Denver Rock Drill Co., Ingersoll-Rand, Sullivan, and Waugh machines are used in mining, the air being supplied by two 6-drill Ingersoll-Rand steam-driven compressors at the beach.

PRINCETON MINING & MILLING CO.

The Valpariso mine is situated on the shore of Paul Lake, near Dolomi, on the eastern side of Prince of Wales Island.

The vein varies in width from a mere seam to 14 feet and averages about 4 or 5 feet. The gangue is quartz and lime; the country rock, schist and dolomitic limestone. The strike is, roughly, east, and the average dip is 30° north.

A shaft has been sunk on the ore a little over 300 feet, with four levels at intervals of 90, 50, 50, and 128 feet. A drainage tunnel runs from the second level to the lake.

At the mill the ore passes over a 1-inch grizzly; the oversize is reduced to that size by an 8 by 10 inch Blake crusher and falls with the undersize into a 100-ton bin. A Challenge feeder feeds a five-stamp Hendy battery in which the stamps weigh 1,250 pounds each, and drop 9 inches 90 times a minute. The ore, crushed to one-fourth inch, passes to a 5-foot Chilian mill, which crushes it to approximately 80 mesh. The pulp goes to a classifier and amalgamation plates, the oversize returning to the Chilian mill. The plates, 5 by 12 and 5 by 16 feet, are set on a grade of 1 inch to 1 foot. From these the pulp passes to a Callow classifier; the coarser product goes to Diester roughing tables and the fines, after being dewatered, to three Diester slimers. The concentrate is stored for shipment.

Two Pelton-Doble wheels under a 250-foot head supply approximately 80 hp. An air lift is used to elevate the water from the sump to the drainage level, the air for this and the machines being furnished by a Denver hydrocompressor, which has a capacity of 400 cubic feet of free air a minute under a 250-foot head. In periods of low water, two Ingersoll-Rand two-stage Imperial type, steam-driven compressors are used. Sullivan, Ingersoll-Rand, and Excelsior Drill Co. machines are used underground.

READY BULLION MINING CO.

The Ready Bullion group of claims is situated about 1¼ miles from Hollis, on Twelve Mile Arm, an inlet of Kasaan Bay, on the east coast of Prince of Wales Island.

A horse tram with rails of 4 by 4's covered with strap iron has been built from the beach to the mine and is used for hauling supplies.

The well-defined vein, which shows several inches of gouge on both walls, is a few inches to several feet thick, averaging 6 or 7 inches. It strikes N. 25° W. to N. 35° W., and dips 35° to 50° NE. The country rock is altered tuff, slate, and quartzite. The property is opened by four drifts, the third or mill level having been driven for a distance of nearly 1,200 feet.

The method of mining is worthy of especial mention, as it has greatly reduced working costs. After a drift has been driven the hanging wall is shot down about 6 feet above the drift for a width of 3 feet and the ore is stripped. Heavy stulls are then set across the top of the drift and lagged. Every 50 feet a close-lagged oreway and manway is started, and between these three waste chutes are built. Another cut is then shot off the hanging wall; the ore is stripped on canvas and shoveled into the oreways. As the stopes proceed, just enough waste is drawn through the waste chutes to give headroom. The manways and oreways are kept tightly lagged, but the waste chutes are always built only a trifle above the stulls on the drift level, so only a small percentage of the waste is shoveled.

At the mill a 4-foot Pelton wheel, under a 347-foot head, furnishes power for the compressor and mill equipment, except the table which is driven by a 16-inch wheel. The ore passes over a 2½-inch grizzly to an 8 by 10 inch Blake crusher and then goes to the bins. From these it is fed to a Risdon 5-stamp battery with 60-mesh screens by a Risdon automatic feeder. The stamps weigh 1,000 pounds each and drop 7 inches 90 times a minute. The pulp passes over amalgamating plates to a Standard table, the concentrates being shipped to the Tacoma smelter.

RUSH & BROWN MINE.

The mine owned by Rush & Brown is on Prince of Wales Island, near the head of Kasaan Bay, on the northern side.

The ore bodies are of two types—magnetite-chalcopyrite ore in a contact between intrusive diorite and altered sediments and chalcopyrite in a shear zone in altered sediments. The former is known as the magnetite and the latter as the sulphide ore body. Both have been opened from a 250-foot shaft with three levels, and a winze is now being sunk to 300 feet. The ore from the magnetite body has been mined by a number of stopes and an open pit more than

100 feet deep; the workings in the sulphide body are stopes. Both ore bodies have a general east strike and dip south. Only shipping ore has been mined from either ore body, although large bodies of milling ore have been opened. The ore is washed and hand sorted in a sorting station and lowered on a balanced tram 300 yards to the mine bunkers. From here it is hauled 3 miles to the wharf and stored in bunkers, having a capacity of about 1,000 tons, for shipment to the smelter. During the past year the shipments have been to the Granby smelter at Anyox, British Columbia.

SEA LEVEL DEVELOPMENT CO.

The company, which had an option on the Sea Level and Sea Breeze claims the past season, pumped out the 100-foot shaft on the Sea Level, and extended the drift at the bottom 50 feet. About 70 feet of drifting was done on the Sea Breeze claim.

THE B. L. THANE EXPLORATION CO.

The company had an option on the Poorman group, about 2 miles northwest of Kasaan, on the east coast of Prince of Wales Island, and did a little development.

The ore is magnetite associated with a small amount of chalcopyrite.

SITKA DISTRICT.

CHICAGOFF MINING CO.

The high-grade gold bearing quartz vein in the Chicagoff mine lies in a shear zone in graywacke. The property, which is situated on Klag Bay, on the west coast of Chichagof Island, about 50 miles northerly from Sitka, and embraces the original Chicagoff mine and the adjoining Golden Gate ground, has been opened by a drift from which shafts 840 and 2,500 feet from the tunnel mouth have been sunk 800 feet on the ore. A 634-foot raise has been driven from this drift to the Golden Gate workings to provide an oreway and ventilation. Eight levels have been opened from the first incline and six from the second, and at the face of the main drift there is approximately 2,200 feet of backs.

There are two mills on the ground, the Chicagoff and the Golden Gate. In the former, which contains 20 stamps, the ore passes from the batteries over plates to a tube mill from which it goes to a second set of plates. From these the pulp passes over Diester tables and is finally treated by flotation. In the Golden Gate mill there are 10 stamps and the battery pulp after passing over amalgamation plates is treated on Wilfley tables.

PACIFIC COAST GYPSUM CO.

At the Gypsum mine, at Gypsum, on the east coast of Chichagof Island several bodies of gypsum have been opened, the largest being developed through a 185-foot 3-compartment shaft with levels at the 75 and 196 foot points. The deposit strikes southeast, dips about 30° northeast and is 100 to 150 feet wide. Drifts and crosscuts are run from the shaft and raises are driven from which stopes are opened on the full-breast system.

A Hendrie & Bolthoff twin-cylinder 8 by 12 inch double-drum hoist raises the gypsum to the mine bunkers, which have a capacity of 3,000 tons. From the mine the gypsum goes over a 1-mile railroad to the wharf, where it is stored in bins having a capacity of 2,000 tons. From there it is shipped to the company's plant in Tacoma, Wash.

SOUTHWESTERN ALASKA.

COPPER RIVER DISTRICT.

ALASKA CONSOLIDATED COPPER CO.

Development work was continued at the company's property by the eastern interests that hold an option. The mine is situated on Nugget Creek, a tributary of the Kuskulana, and is about 16 miles from Strelna, a station on the Copper River & North Western Railroad. During the winter a power plant and compressor were installed.

GREAT NORTHERN DEVELOPMENT CO.

Only assessment work was done at the company's property, which is on Clear Creek, a tributary of the Kuskulana.

HUBBARD-ELLIOTT COPPER CO.

Development was continued at the company's property on Elliott Creek, a tributary of the Kotsina.

KENNECOTT COPPER CORPORATION.

The corporation is working two mines, the Bonanza and the Jumbo, on Bonanza Mountain, and is developing several prospects in the Copper River district. The mines are close together and about 3 miles from the concentrator at the terminal of the Copper River & North Western Railroad.

Both mines are connected with the concentrator by Bleichert aerial tramways and at both most of the ore is chalcocite with smaller amounts of covellite and copper carbonates. The ore occurs in irregular bodies and seams throughout the limestone; there is no regular method of mining, but a separate plan is adopted for each ore body, according to its size and slope. In the larger masses the high-grade ore has been worked in benches; the mill-ore has been blasted in from the sides to fill the slopes and then drawn as needed. The limestone is hard and stands well, permitting the opening of chambers of a size that in a softer rock would be attended with considerable danger.

The Jumbo mine is opened by an inclined shaft, 30°, with levels 100 feet apart vertically. This shaft is being sunk from the 700 to the 800 foot level. Ventilation is natural except for the air from the machines and the small blowers used to force air into the dead ends of the drifts. The tramway from the mine to the concentrator, completed last year, has a capacity of 20 tons an hour at a speed of 528 feet per minute. It is 15,250 feet long and has 19 towers, three breakovers, and three tension stations. The track cable on the loaded side is 1¼ inches in diameter, on the empty side 1 inch, and the haulage cable is seven-eighths inch. Each bucket has a capacity of 6 cubic feet.

The air-compressor plant at the Jumbo comprises two Ingersoll-Rand Imperial type, Class XB–2, 15 and 9 inches by 12 inches, cross-compound, 2-stage compressors, each having a piston displacement of 513 cubic feet of free air a minute belted to 79½-hp. Westinghouse type C. W. motors; one Ingersoll-Rand Imperial, class NE–1, 12¼ by 12 inch single-stage compressor with herringbone gear connection to a 50-hp. Westinghouse type C. S. induction motor; and two small compressors, not in use at present time, each with a piston displacement of 310 cubic feet a minute.

The Bonanza mine is opened by a crosscut and inclined shaft sloping 26 to 33 degrees, and a glory hole. As the shaft is too small for good work and a larger part of it is in ore, a new 3-compartment shaft which will provide two hoisting compartments and a manway, is being raised from the 600-foot level to the main crosscut. This year a crosscut was completed on the third level to the Mother Lode side of the mountain and a raise driven to surface for air and a manway. All ventilation is natural except for the air from machines and that from small blowers for the dead ends of advance workings.

The Bonanza tramway, 15,450 feet long, with 44 towers, an angle station, and a tension station, has a capacity of 18 tons an hour at a speed of 452 feet a minute. The diameter of the track cable on the loaded side is 1⅛ inches, on the empty side seven-eighths inch, of the haulage cable eleven-sixteenths inch. The buckets have a capacity of 5 cubic feet each.

The air compressor is an Ingersoll-Rand, class PE–2, 25¼ and 14¼ inches by 21 inches, cross-compound, two-stage; with a piston displacement of 2,030 cubic feet of free air per minute, it is directly connected to a 250-hp. Westinghouse synchronous motor.

In the power plant, which is on the concentrator site, are two 305-hp. special Erie City oil-burning, water-tube boilers, which furnish steam at 160 pounds, working pressure. The prime movers are: An Allis-Chalmers 33 and 17 inch by 21 inch reciprocating engine, direct-connected to a 400 k. v. a. Allis-Chalmers class A–1 generator; a 500 k. v. a. Westinghouse turbo-generator and a Pelton wheel, direct connected to a 200 k. v. a. Westinghouse type G generator. Current is generated at 480 volts and used at this pressure in the mill; for transmission to the mines it is stepped up to 10,000 volts but is stepped down to 480 where it is used. Two oil tanks with a total capacity of 153,000 gallons hold the fuel oil.

At the concentrator the ore is crushed and passed over an automatic weighing belt, then it is sampled and hand-sorted. The high-grade ore is shipped without further treatment but the low grade is crushed and classified to obtain a high-grade concentrate, which is shipped, and a tailing which goes to the leaching plant.

A 6,095-foot tram, Leschen & Sons, connects the mine with 1,500-ton ore bins on McCarthy Creek, the difference in elevation of the terminals being 2,798 feet. Its capacity is 100 tons in an 8-hour day. The diameters of the cables are: Loaded side, 1⅛ inches; empty side, seven-eighths inch; and haulage, three-fourths inch.

The power plant consists of an 80-hp. twin-cylinder Otto gas engine, a 125-kw. 3-phase Payne generator, a 3½-hp. gas engine, which compresses air for the starting device of the Otto engine, a Sullivan, type W. C. 4, air compressor, driven by a 75-hp. motor, a direct current 7-hp. generator, connected with a 2½-hp. fan, a 7-hp. alternating current motor, to run a 7-hp. fan, a No. 5 Cameron sinking pump, worked by air or steam, and a double-cylinder 6 by 8 inch air or steam hoist. Sullivan drills are used underground.

MOTHER LODE COPPER MINES CO.

The company's property is about 1¼ miles from the Kennecott Bonanza mine and 14 miles from McCarthy, a station on the Copper River & North Western Railroad. During the winter months the ore is sledded over a wagon road down McCarthy Creek to the station.

The ore body is 2 to 19 feet wide. The predominant mineral is chalcocite, which is associated with sulphides and carbonates. The country rock is limestone. The main ore body strikes generally N. 22° E.; it dips 80° E. in the northern part of the workings, and 70° W. in the southern part.

The property has been opened on four levels for a vertical distance of over 250 feet, the lowest level being tapped by a crosscut at an elevation of 5,585 feet. A 2-compartment shaft has been started on this level, though work has been temporarily discontinued on account of the high cost of power.

NORTH MIDAS COPPER CO.

The property is situated about 11 miles from Strelna, on the south side of the Kuskulana River. In the group are 12 lode claims covering a number of outcrops of copper-bearing ore, the predominant mineral being chalcopyrite. Four crosscuts have been driven to intersect the lodes.

PLACER MINING.

Most of the placer mining in the Copper River district was on tributaries of the Chistochina and Nazina Rivers, though a number of smaller properties were worked on the Brenner and other tributaries.

On Dan Creek, a tributary of the Nazina, the Dan Creek Mining Co. works a group of claims. As the creek has a comparatively rapid fall and is extremely turbulent during high water, this company has had to meet many difficulties. In opening the ground the main body of the creek is flumed past the area to be worked, wing dams set, a bedrock flume laid, and the gravel washed into the flume by giants. Railroad iron is used for riffles and a tailing giant at the lower end of the flume stacks the waste. As the pits are worked out, the wing dams are moved up stream and the flumes extended.

On Chititu, also a tributary of the Nazina, Esterly & Andrus had the largest placer operations, working one plant on the main stream and a second on Rex, one of the principal branches. On Chititu, a bedrock flume is laid in the spring through the part of the ground to be worked that season. Giants are set at the upper end of the block and the pit worked downstream, the sluices being extended as necessary to carry the tailings. Railroad iron and sawed blocks are used for riffles.

Near the mouth of Rex, Frank Kernan worked a small hydraulic plant, and a few claims up the creek E. W. Brooks employed a few men on similar work. Bert Carvey worked a bench claim on the same creek when water was available.

On the Chitistone, Slate Creek and its tributary, Miller Gulch, were the center of activity, though scarcity of water on Miller Gulch prevented extensive work. At the mouth of Slate Creek J. M. Elmer and associates worked three placer claims under lease. A 20-inch pipe conveyed the water to one 4-inch and two 5-inch giants under a 140-foot head. The gravel bank was approximately 20 feet high.

Several claims above this is the John S. Miller group of three claims. Here water from two streams under a 280-foot and a 390-foot head is directed against a 20-foot bank by one 4-inch and one 3-inch nozzle. Meyer & Prolig, Kraemer, Leavell & Hemple, William Schroeder, Bert McDowell, and the Canaille brothers all worked small plants in the same locality, and a number of others did assessment work on their claims. The gravels of the lower Chesna were drilled by John Hazelett to test their availability as dredging ground. On the upper Chesna, Holmes & Brail worked a small plant.

KENAI PENINSULA.

ALASKA CROW CREEK MINING CO.

The company does hydraulic mining on a group of 29 creek and bench claims on Crow Creek, a tributary of Glacier Creek, about 5 miles above its mouth. Glacier Creek flows into Turnagain Arm from the northern side, crossing the surveyed line of the Government railroad at Glacier. The group covers several miles of the creek bed.

Much of the company's energy in the past has been expended in efforts to get the property in good working condition and the work was not completed until the fall of 1915. The gravels toward the lower end of the creek, most of which were comparatively barren, were sluiced to bedrock and a flume built to pass the stream around that point. A bedrock flume 2,200 feet long, 5 feet wide and 5 feet deep was built in this cut on a grade of 7 inches to the box length (12 feet). At the intake the floor of the first box is made of manganese steel plates. The next seven have railroad iron for riffles and the rest have 14-inch sawed, wooden blocks.

A ditch about a mile long conveys the water from the upper part of Crow Creek to the penstock which gives a head of 300 to 400 feet at the bottom of the pit. The main pipe line is 24 inches in diameter, several giants being operated, according to the stage of the water.

The property is equipped with a sawmill that furnishes lumber for the flume and dwellings.

ALASKA SECURITIES CORPORATION.

The corporation has recently consolidated several groups of placer claims on Lynx Creek, where it is installing a plant, and is drilling another group on Canyon Creek, just above the forks of the Government road.

On the Lynx Creek group a ditch nearly a mile long and a 4,000-foot pipe line is under construction which will give a 400-foot head. A tunnel has been driven through a low ridge to give room for the disposal of the tailing, and a bedrock flume has been laid. Hungarian riffles are used for the first two box lengths, and sawed blocks for the remainder.

On Canyon Creek the company has had a Keystone drill busy testing an old channel the past summer.

BLUEBELL AND PRIMROSE MINES.

Some development work was done at the Bluebell and Primrose groups about five miles southwest of mile post 18 on the Alaska Northern Railroad. Several veins on both groups have been prospected superficially by short drifts and crosscuts and at the Primrose a small Little Giant mill has been installed. The veins, quartz in a slate-graywacke country rock, carry gold. Most of the ore is free milling. Shoots of arsenopyrite contain considerable gold and silver and during the past season a test sample of 10 tons of this ore was shipped to the Tacoma smelter. Both groups have been under the same management for the past two years.

GILPATRICK MINE.

Only assessment work was done at the claims situated about 15 miles from mile post 29 on the Alaska Northern Railroad during the past season. There are several veins, but the greatest amount of work has been done on a mineralized dike adjacent to one of them. This dike is well above timber line and has been opened by several hundred feet of drifts and raises. An arrastra has been installed on the creek near the bottom of the canyon to treat the soft oxidized ore from the surface. The high-grade ore is sacked and hauled down the mountain on sleds.

HERRON DREDGING CO.

The dredge near Sunrise was idle during the past season.

KENAI–ALASKA GOLD CO.

The company owns a group of five lode and three placer claims on the north side of Falls Creek, about 4 miles from mile post 26 on the Alaska Northern Railroad. The mine, which is situated at an elevation of 4,500 feet, has been opened by two crosscuts with connecting raises and stopes. It is connected with the 5-stamp Hendy mill by an 8,200-foot tram which has a fall of 2,400 feet between terminals. This property was under lease a part of the year to Drenan & Sweitzer.

LUCKY STRIKE MINE.

The Lucky Strike group of five lode claims is owned by John Hirshey; it is situated on a ridge at an elevation of 3,500 feet, at the head of Palmer Creek, a tributary of Resurrection Creek, about 14 miles from Hope.

The lode, a series of veinlets in a crushed and broken slate, strikes east and has a variable dip to the northwest. Two crosscuts have been driven to intersect the ore, but owing to limited milling facilities only the high-grade stringers have been worked. A 1,000-foot jigback tram takes the ore to a flat whence it is hauled about half a mile on sleds to the mill. The ore passes through an 8 by 10 inch jaw crusher and drops into a 10-ton bin, whence it is fed by a Challenge feeder to a Moyle one-stamp battery, using a 30-mesh screen.

The stamp weighs 400 pounds, has a 6-inch drop, and falls 110 times a minute. The pulp passes over amalgamating plates to an Ogden concentrator and is stored for future treatment. The concentrate is shipped.

MATHISON MINING CO.

The company is working a group of 18 claims and a fraction on Resurrection Creek, about 3½ miles from Hope. The main flow of the creek is carried along one bank, while the opposite side is worked in a series of pits, as the creek is wide and there is but little fall. A 48-foot sluice, 4 feet wide, with a grade of 7 inches to the box length, has small railroad iron for riffles. Three or four No. 2 giants are kept busy, according to the stage of the water, which is brought in under a 350-foot head. The tailing is washed clear from the sluices with a tailing giant. A steam shovel has been at work for a few seasons digging a 7-mile ditch for more water.

PEARSON BROS.

The Pearson Bros. worked a group of eight claims on Resurrection Creek, about 6 miles from Hope. The creek water is carried in a ditch along one bank, while the creek bed is worked in a series of pits. The gravel is 5 or 6 feet deep and comparatively free from large bowlders. Water for hydraulicking is brought to a penstock, which gives a fall of 310 feet. At the intake the hydraulic pipe has a diameter of 24 inches, which is reduced to 11 inches where the water is distributed to the giants.

RONAN & JAMES.

Ronan & James have a lease and bond on the Champion and Gladiator lode claims in the Moose Pass district, where they installed a small arrastra this season.

The vein, about 12 inches wide, strikes N. 60° E. and dips southeast. A crosscut from a 50-foot shaft taps the ore 85 feet below the shaft collar. Drifts have been started along the vein at the crosscut and a stope is being driven to tap the shaft and furnish ventilation.

SCHEEN-LECHNER MINE.

Only assessment work was done at the Scheen-Lechner group during the season. The group is on Falls Creek, about 4½ miles from mile post 25 on the Alaska Northern Railroad.

ST. LOUIS MINING & TRADING CO.

The company is working a group of placer claims on Resurrection Creek, about 4 miles from Hope. The creek water is carried along one side of the channel while a series of pits on the other side are worked out. Giants wash the gravel into a 36-foot flume, 4½ feet wide, in which 60-pound railroad iron is used for riffles. Another giant stacks the tailing. A 30-inch pipe line, reduced gradually to 11 and 9 inches at the giants, brings the water 1½ miles and gives a fall of 137 feet.

MATANUSKA-SUSITNA DISTRICT.

ALASKA FREE GOLD MINING CO.

The company's property, under lease to William Martin, of Seattle, is on Fishhook Creek, just to the west of the Independence.

Several rather irregular ore bodies have been opened at a number of different points without any special method of development, though connections have been made on the ore from the east to the west side of the mountain. The ore bodies are all in a blocky diorite, strike approximately N. 20° W., and dip 38° to 40° southwest.

The mine workings are about 1,000 feet above the mill, with which they are connected by three aerial tramways. On the east side of the mountain a 750-foot tram connects the mine bins with an intermediate bin, from which the ore is trammed over a track about 500 feet long to a second mine bin. From here it is lowered to the mill over a single-span, 2,100-foot tram. West of this a single-span, 2,400-foot tram, connects another set of mine bins with the mill, and farther west, a third tram, 4,500 feet long with two towers, connects another set of workings to the mill. All track cables have a diameter of ⅝ inch and the haulage and tail ropes ¼ inch. The buckets have a capacity of approximately 450 pounds.

At the mill bins, which have a capacity of 80 tons, the ore is crushed by a jaw crusher to 1½ inches and is fed automatically to two 10-foot slow-speed Lane mills making 6 to 8 revolutions a minute. The size of the pulp is governed by the height of discharge and the amount of feed water. Quicksilver is fed to the mills and the pulp is split into four parts, going over 5 by 10 foot plates set on a grade of 1½ inches to the foot. From these it passes over two Barnes concentrators to classifiers and then to the cyanide plant. The slime is impounded for possible future treatment, and the concentrate is shipped to the smelter.

The cyanide plant comprises four 30-ton leaching tanks—two sump and two solution tanks—the pulp being given a 4-day treatment. The gold is precipitated on zinc shavings; the precipitate is dried, roasted, and shipped to the smelter.

Power for the plant is furnished by a 10-inch turbine under a 54-foot head, a 25-horsepower and a 16-horsepower gasoline engine all belted to the same shafting.

CACHE CREEK DREDGING CO.

The dredge erected on Cache Creek during the past spring represents the first serious attempt at gold dredging in this part of the Territory.

The bedrock includes slates, graywackes, sandstones, and shales, with occasional beds of lignite. The creek is comparatively shallow, its average depth being approximately 6 feet, so the dredge has a large hull, 87 feet long, 54 feet beam, and 7 feet deep, for shallow draft. The planks of the bottom are 4 by 12 inches, those on the sides 6 by 12 inches, and the deck 3 by 12 inches. The winch deck is 30 feet above the main deck and the pilot deck is 12 feet above this. The spuds, made of wood reinforced with steel, are 44 feet long and weigh 11 tons each.

The 65 close-connected 7-foot buckets have manganese-steel lips; and although the dredge has a capacity of 3,000 cubic yards in 24 hours, the management has based its plans on an output of 2,000 cubic yards, on account of the shallow ground and the number of bowlders. The latter have retarded the speed of the dredge, but have not proved a serious hindrance, as they are not large enough to require special devices for handling. With the present number of buckets, the dredge can dig 30 feet below water line, though it probably will not be called upon to work at anywhere near this distance on this part of the creek.

The gravel from the buckets falls over an 11-inch grizzly into a 48-inch flume, 108 feet long. The grade of the flume is adjustable, though the best results are obtained by keeping it at a fall of approximately $1\frac{1}{8}$ inches to the foot. The riffles are 2 by 4's capped with $\frac{5}{8}$-inch manganese-steel plates and are set $1\frac{3}{4}$ inches apart. A 6-inch centrifugal pump supplies wash water at the grizzly and an 18-inch centrifugal pumps directly to the flume. The buckets are washed clean by water from two nozzles and the washings fall to a save-all sluice with Hungarian riffles. This sluice is 18 inches wide and set on a grade of 1 inch to the foot.

A feature never used before on an Alaskan dredge is the construction of rock chutes from the grizzly. The oversize from the bars passes to a Y. The branches of the Y pass on each side of the save-all sluice and empty in the pond aft of the dredge, where the rock forms a dam and prevents the fines from filling the pond under the boat. These chutes are 42 inches wide and lined with manganese-steel plates at points of greatest wear.

Power is furnished by a 250-horsepower Yarrow tubular boiler, using coal mined locally for fuel. A 150-horsepower Reaves engine drives the pumps and dynamo, a 125-horsepower Lidgerwood the digging ladder, and a 20-horsepower the winches. The exhaust steam from the engines passes to a condenser.

A number of beds of lignite outcrop on Cache Creek and its tributaries from which an ample supply of fuel may be had at low cost. The company has obtained a free-use 10-acre permit to mine coal and in the summer of 1916 obtained its supply from an open cut about 2 miles from the dredge, but a contract has been let to drive entries and open rooms on a 5-foot bed on the creek during the winter, so that fuel will be easily available at a convenient point in the spring. The coal burns with a long flame almost like wood, and makes a good steaming coal, though the percentage of ash is high. If the company had not owned the steam equipment before the boat was planned, the situation would have been ideal for electric operation by the power generated at the point where the coal was mined.

After a short though successful season, the only change planned on the dredge is a second bull wheel, so that the drive will be on both sides of the bucket line.

DOHERTY COAL MINE.

In the spring of 1916 a contract was let by the Alaskan Engineering Commission to R. C. Doherty to furnish 2,000 tons for the use of the railroad, and Mr. Doherty opened a small mine on the west bank of Moose Creek, about a mile above the railroad right of way.

An 800-foot drift was driven on a bed which strikes S. 50° W. to S. 70° W. and dips 40° to 53° SE. Fifteen feet above this an airway was driven and rooms were turned from it. The 100-foot rooms were 20 feet wide with 10-foot pillars, but later rooms were driven double, or 50 feet wide, with 30-foot pillars. They were driven along the bed to the conglomerate that covers the outcrop except in the creek valley. The coal is lignitic, and the bed gives off a little gas, although ventilation is entirely natural, except a small homemade fan in the dead ends has been used. The thickness of the bed varies from point to point, averaging more than 3½ feet. A typical cross section is as follows:

Section of lignite bed on Cache Creek.

Material.	Thickness.	
	Ft.	*in.*
Hard sandstone roof.		
Scaly sandstone with stringers of coal	0	4 to 6
Hard black coal with many "niggerheads"	1	6
Shale parting.		
Fairly hard black coal with irregular fracture and no well-developed cleat	1	0
Lignite coal with woody structure	1	6
Soft dark brown shale	0	6
Hard sandstone bottom.		

Several other partings in the bed lack regularity. In places the sandstone footwall is replaced by fire clay.

The coal is hauled in cars, capacity 4 cubic yards, from the mine to the railroad bunkers by a 35-horsepower locomotive.

INDEPENDENCE GOLD MINES CO.

The company is working the Independence, a lode gold mine, near the head of Fishhook Creek, a tributary of Little Susitna River.

There are two veins, the Granite Mountain and the Independence, in a blocky diorite. The strike of both veins is approximately N. 10° W.; the Independence dips about 40° and the Granite Mountain 0° to 26° SW. The workings on the Independence are at an elevation of 4,650 feet; those on the Granite Mountain 4,100; and the mill is at an elevation of 3,650 feet. On the Granite Mountain, where the bulk of the work has been done, a drift has been run 529 feet on the vein. From the end of the drift an incline, which flattens about one-third of the way down, has been sunk 480 feet on the vein and from these two both overhand and underhand stopes have been driven wherever the value of the ore warranted. Stulls are used to support the roof, and the waste is used for pack walls.

The bins on the Independence are connected with the mill by a single-span, 2,800-foot aerial tramway with $\frac{5}{8}$-inch track and $\frac{1}{4}$-inch haulage and tailrope cables. The Granite Mountain bins are connected to the mill by a 1,730-foot tram with similar cables. Both tramways carry 400-pound buckets.

At the mill the ore passes over a 1-inch grizzly to the bins, the oversize going to a 7 by 9 inch Dodge crusher. From the bins it is fed automatically to a 3-stamp battery of 500-pound stamps and one 1,300-pound Nissen stamp. The practice is to crush to 40 mesh, using both inside and outside amalgamation; the pulp from the batteries flows over plates set on a grade of $1\frac{3}{4}$ inches to the foot. From the plates the pulp passes over an Ogden concentrator to tailing ponds. The mill capacity will be increased this year by a 5-foot, 6-inch Denver mill, with a rated capacity of 30 to 40 tons in 24 hours when run at a speed of 30 revolutions per minute. The pulp from this mill will pass over amalgamating plates to a Wilfley table and be stored for future treatment.

MABLE MILLING, MINING & POWER CO.

The company is opening a lode mine on Archangel Creek, a tributary of the Little Susitna, just above Fishhook. Some open cuts have been made and a drift run on the ore, which is in a blocky diorite. A 15-ton Denver mill is being installed about 1,200 feet below the mine and a 3-500-foot tramway with one tower is being erected to convey the ore from the mine to the crushing plant.

WILLOW CREEK MINES CO.

The company is working the Gold Bullion mine, on the divide between Willow and Craigie Creeks, under lease and bond, and is also operating the Nugget property, which joins the Gold Bullion on the

Willow Creek side and the Brooklyn Development Co.'s ground on the west side of Willow Creek.

The mine is situated at an elevation of 4,500 feet and, as the vein is comparatively flat, has been opened by a number of drifts. These have been started where the value of the ore on the surface warranted and an irregular system of overhand stoping followed, according to the size and value of the ore bodies. The roof is supported by stulls and pack walls built with the waste. The vein, which fills a fissure in a grano-diorite, varies from 8 inches to 7 feet thick, has an average strike of S. 10° E., and dips approximately 14° NW. Through the diorite, which is rather blocky, are numerous quartz stringers, some of which are large enough and contain enough gold to be profitable mining.

Owing to the nature of the ore bodies, the mine bins are connected by a light aerial tramway, which can be easily moved, with intermediate bins, and there are connected to the mill by an aerial tramway of more substantial construction. The mine bins are 700 feet above the intermediate bins and the latter 800 feet above the mill. One 2,500-foot span connects the mine and intermediate bins with three-fourth-inch track and one-fourth-inch haulage and tail-rope cables which carry two 5-cubic-foot buckets. This tram runs entirely by gravity. The line from the intermediate bins to the mill is 3,800 feet in length with seven towers. The track cables are seven-eighths of an inch in diameter, the haulage and tail rope one-fourth inch, and the buckets contain 7 cubic feet. For a short distance of the bucket travel it is necessary to use a small amount of power. As the mine is far above the timber line it is necessary to send up all mine timbers as well as supplies for the mine camp over these tramways.

At the mill the ore goes over a 7 by 9 inch Blake crusher to bins having a working capacity of 160 tons, from which it is fed to the stamps by Challenge feeders. There are three batteries, two 5-stamp, and one 2-stamp, which crush the ore to one-half millimeter, using a diagonal slot screen. Seven of the stamps weigh 1,050 pounds each, the others 850 pounds, but these will probably be increased in weight at a later date. They fall 6 inches and drop 105 times per minute. Both inside and outside amalgamation is used. From the batteries the pulp flows over standard 5 by 10 foot plates set on a grade of 1¼ inches to the foot. The pulp is carried by launders to a hydraulic classifier, the oversize going to a second classifier, the spigot product to a Wilfley table. The overflow from the second classifier is sent to the slime pond for storage and the spigot discharge to a second Wilfley. The Wilfley concentrate is treated on the ground or shipped to the Selby smelter, according to its value. The sand is pumped to the cyanide plant, which consists of five 30-ton leaching tanks, two sump tanks, one make-up and one storage tank. The pulp is given a four-day treatment and the gold precipitated on zinc shavings. The precipitate is dried, roasted, and shipped to the Selby smelter.

The power for the mill is furnished by a 12-inch reaction turbine under a 25-foot head with a 12-foot draft tube. A 2,000-foot pipe line, consisting of four sections 500 feet each of 8, 7, 6, and 5 inch pipe, is being laid to furnish additional power.

This spring the mine, intermediate, and mill bins have been enlarged and the five 850-pound stamps added to the equipment, giving the plant a capacity of approximately 40 tons per 24 hours.

PLACER MINING.

Placer prospects may be found scattered over a large part of this district, but the most productive localities are on Cache and Valdez Creeks.

On Cache Creek the largest operator is the Cache Creek Dredging Co., previously described. The Thunder Creek Mining Co. operated three plants—one on Falls, one on Windy, and one on Thunder Creeks, all tributaries of Cache.

On Thunder, a comparatively short creek, work was carried forward near the lower end and center of the claims. The gravel, being shallow (2 to 4 feet deep), was sluiced off in a series of pits in each section with 3-inch nozzles. The method of operation was to set the sluices, which were 20 inches wide, on a grade of 5 inches to 12 feet in a worked-out pit. A small wing dam was built at the upper end of the sluice and a pit 100 to 150 feet long and about 40 feet wide worked out. The sluices were then moved to the opposite side of the creek and the gravel there washed off. The boxes were then moved forward and the bedrock of one of the first pits shoveled while the cycle was repeated on the gravel above.

On Windy Creek the Thunder Creek Mining Co. operated two 4-inch giants under a 225-foot head against a 225-foot bank of gravel.

The other operators of this locality were Tesmer & Beidermann and William Peterson, on Cache Creek; Bubb & Bahern, on Dollar Creek; Ebheart & Anderson, McElroy & Remmer, J. C. Funk, and A. A. Adams, on Falls Creek; Gage & Mack, on Thunder Creek; Harper Bros., Smith & Hogan, Hugh Price, and Carl Raymond, on Nugget Creek; Weatherall & Andresen, on Gold Creek; Chris Hamersmith and William Gredaken, on Bird Creek; Frank Jenkins, John Rice, and Chris Hansen, on Willow Creek; Kast, Nelson & Larson, on Poorman Creek; Richard Richardson, on Ramsdyke Creek; Francis & Foster, on Long Creek; Van Eiderstein, on Peters Creek; Wolf & Maloche, on Spruce Creek; and John Gray, on Treasure Creek.

On Valdez Creek the largest operations were carried on by the Valdez Creek Placer Mines Co., which has been installing a hydraulic plant and preparing for work on a large scale for the past few years. Clark Duff and C. J. Carlson operated in a small way in the same district. A number of others did assessment work on their holdings.

PRINCE WILLIAM SOUND.

ALASKA MINES CORPORATION.

The corporation operates the Schlosser property, about three-fourths of a mile from the beach, on the south side of Fidalgo Bay. The ore, chalcopyrite mixed to a greater or less extent with massive iron sulphide, is found in lenses along a shear zone which vary in size but have a fairly consistent strike of N. 20° E. and are nearly vertical.

The property has been opened by drifts on four levels, the third or tram level being at an elevation of 796 feet. The fourth level is 138 feet below the third, the second is 129 feet above it, and the first 75 feet above the second. More or less stoping has been done on all the levels and connections have been made between the third and second.

A 600-ton ore bunker has been erected at the wharf and connected to the mine by an aerial tram. The diameters of the cables are five-eighths, seven-eighths, and 1⅛ inches, respectively, for the traction, empty track, and loaded track cables.

ALICE MINES (LTD.).

The property of the Alice Mines (Ltd.) is situated on the north shore of Shoup Bay. The fissure crosses a slate-graywacke series with a strike of N. 62° W. and a dip of 20° to 80° S. The vein is 6 inches to 2½ feet wide. It has been opened by a 250-foot drift and a 170-foot shaft, the bottom of which is 100 feet below the drift level. From the bottom of the shaft drifts have been driven 50 feet in each direction along the vein.

The property is equipped with an 8 by 10 inch twin-cylinder steam hoist, 100-horsepower boiler, a compressor with a capacity of 360 cubic feet of free air per minute, machine drills, pumps, and electric lighting plant.

BANNER MINE.

The Banner group of claims on the south shore of Bettles Bay, a small body of water off Port Wells, has been developed by C. Christopher, under bond, during the year. The vein is a fracture zone in a siliceous dike, which strikes northeast and dips steeply northwest, the broken material being cemented with gold-bearing quartz. A drift has been driven along the ore, which varies from 1 to 6 feet wide, for about 200 feet. It is planned to install a mill and mining machinery in the spring.

CLIFF MINE.

At the Cliff mine, on the north shore of Port Valdez, about 12 miles from the town of Valdez, two drifts were driven above the old workings and a raise started to connect them. The ore from this development was hauled to the mill and crushed whenever a sufficient amount had accumulated to warrant starting the plant, which contains six Nissen stamps.

CUBE MINES CO.

The company is developing the Three-in-One and Cube groups of claims on the north side of Port Valdez.

On the Three-in One the vein varies from 2 to 8 feet wide and crosses a country rock of graywacke. At an elevation of 1,450 feet a drift has been run for 900 feet in the vein and 175 feet above this a drift has been driven 400 feet. The two have been connected by a raise. The company has purchased equipment consisting of a Buchanan jaw crusher, a Hardinge conical mill, three Faust tables, and two Fairbanks-Morse 25-hp. semi-Deisel engines, which will be installed at the property this winter.

At the Cube a drift has been driven 30 feet on complex ore containing copper, iron, and gold. It is planned to ship this material to the Granby smelter at Anyox, B. C.

ELLAMAR MINING CO.

The company operates the Ellamar mine, at Ellamar, on the eastern shore of Virgin Bay, about 20 miles southwest of Valdez. The mine is opened on seven levels from a 600-foot, 3-compartment, vertical shaft, crosscuts being driven from the shaft to the ore body. The outcrop is covered with water at high tide, so a cofferdam has been constructed to prevent flooding. The ore body, a fracture zone in a group of sedimentary rocks, chiefly slates, has a maximum width of 100 feet, and is divided longitudinally into two classes of ore by a layer of slate which has an average width of 4 feet. The northeast or hanging-wall side is heavy, fine-grained pyritic ore with a low copper content and a fair value in gold. On the foot-wall side of the slate the ore contains a higher percentage of chalcopyrite than on the hanging-wall side but its gold content is lower. In the early years of operation, when only the richer copper ore was handled at a profit, the ore was mined through a glory hole and stopes worked on the shrinkage system. For a few years after the old stopes had been emptied no particular method of mining was employed but in 1913 a filling system was adopted whereby the old openings were cribbed and filled and the adjoining ore mined.

For the first few years the waste for filling was obtained from crosscuts and raises in the hanging wall. Owing to the high cost of the filling and to the fact that there was considerable methane in the graphitic slate of the hanging wall, which accumulated in the raises and resulted in several accidents, the filling system was changed. The filling is now obtained from a glory hole, 700 feet from the ore body. It is drawn through chutes to the 100-foot level and hauled by a gasoline motor to the mine, where it is distributed by waste chutes to the particular workings where it is needed. Cribbed chutes are carried up and the stopes filled as the ore is mined. The ore is trammed by hand to the shaft, hoisted, and stored in bins from which it is loaded by an aerial tramway directly to the ship's hold. This year the work has been confined to those parts of the mine above the third level and to diamond drilling.

In the main power plant there is a 250-hp. Geary water-tube boiler and two 70-hp. Brownell locomotive-type boilers. The latter are used as auxiliaries in case the Geary is closed down. Crude oil is used for fuel, the storage tank having a capacity of 1,500 barrels. The hoist is a 10 by 12 inch, duplex-geared, double-loose drum, Vulcan hoist. The compressor is a Nordberg two-stage, cross-compound condensing machine with 12 and 24 inch steam cylinders. The air cylinders are 12¾ and 21 inches in diameter and the stroke is 36 inches. Ingersoll-Rand jack hammers, stope hammers, and type C–110 machines are used underground.

The tramway is of Brodrick & Bascom design. The capacity of the buckets is 14 cubic feet each and the capacity of the tram is 200 tons per hour with a rope speed of 450 feet per minute. The diameter of the track cable on the loaded side is 1⅝ inches, on the empty side 1 inch, and that of the traction cable is five-eighths of an inch.

FIDALGO MINING CO.

The company is operating a group of 24 lode claims on the southeastern shore of Fidalgo Bay, about one-half a mile from the beach.

The ore, chiefly chalcopyrite, lies in a shear zone through slate, graywacke, and greenstone, and strikes N. 30° W., with a dip of 67° NE. Two drifts have been driven along the shear zone to open the ore with raises through to the surface. The ore occurs in lenses of variable size through this zone, the largest so far opened being 6 feet wide. The elevation of the upper drift is 962 feet; the lower one is 100 feet below this. About 500 feet of track has been laid from the lower level to the ore bins, which are connected with the bunkers on the wharf by a 2,000-foot Riblet balanced tramway. The buckets have a capacity of 10 cubic feet each and there are three towers. The track cables are 1 inch in diameter and the haulage cable three-eighths of an inch. The upper bins have a capacity of 50 tons and the lower 500 tons. The ore is hand sorted and shipped to the Tacoma smelter. This year a power plant has been installed containing a

36-inch Pelton wheel belted to an Ingersoll-Sargent compressor having a capacity of 385 cubic feet of free air per minute. The water for the wheel is conveyed 1,200 feet in a wooden-stave pipe, through which a fall of 400 feet is obtained. The upper 600 feet of the line is built of 12-inch pipe; the lower, of 8-inch. Ingersoll-Rand jack hammers are used underground.

GALENA BAY MINING CO.

The assessment work was the only development reported at the Galena Bay mine, on the ridge between Galena and Boulder Bays.

GOLD KING MINE.

The mine near the head of one of the eastern arms of Columbia Glacier, about 22 miles from Valdez, was operated for a short time the past season by the original owners. There are several known veins on the property which cut a slate-graywacke series.

The mill equipment consists of a 6 by 8 inch Dodge crusher, a 3½-foot Huntington mill, and a Frue vanner.

GOLDEN EAGLE MINE.

Only the assessment work was done at the Golden Eagle group, near Golden, in the Port Wells district. The property, which reverted to the original owners sometime ago, is equipped with a five-stamp mill.

GRANBY CONSOLIDATED MINING, SMELTING & POWER CO. (LTD.).

The Granby company operates the Midas mine, in Solomon Basin, across the harbor from Valdez. The ore, principally chalcopyrite in a silicious and pyritic gangue, strikes nearly east and west, and dips approximately 45° north. The ore body, which varies from 1 to 20 feet wide, average about 4½ feet, has been opened by three drifts, with crosscuts and raises, giving over 200 feet of backs. Much of the ore is sufficiently high grade to ship direct to the smelter, so the stopes have been confined to these high-grade areas in the mine, although this work has opened large quantities of ore of an excellent milling grade. It is planned to install a concentration plant at some later date.

During the year a 200-horsepower Diesel engine has been installed which drives a two-stage Ingersoll-Rand Imperial type air compressor with a capacity of 1,000 cubic feet of free air per minute. Ingersoll-Rand, Waugh, and Sullivan machines are used underground.

A 5½-mile Riblet aerial tramway, with a capacity of 15 tons per hour, conveys the ore from the mine to the bunkers at the wharf. The track cables are 1⅛ inches in diameter on the loaded side and seven-eighths inch on the empty side with a five-eighths inch haulage cable. The tram is driven by a 30-horsepower Foos gas engine. The bunkers on the wharf have a capacity of 3,000 tons and load directly on ocean-going vessels with a belt conveyor driven by a 25-horsepower gas engine. The ore is shipped to the company's smelter at Anyox, British Columbia, on Observatory Inlet. About 14,000 tons was shipped to Anyox during 1916.

GRANITE GOLD MINING CO.

The Granite mine is about a mile from the beach, at Hobo Bay, on Port Wells. The vein varies from 1½ to 8 feet wide, averaging approximately 26 inches, has a variable strike, and dips roughly 45° N. The fissure cuts a slate-granite contact, so a part of the ore body is in slate and a part in granite. There are many branches and considerable difficulty has been met in following the ore.

The property was originally opened with a crosscut to an inclined shaft on the ore, since which time a second crosscut has been run on the mill level and a raise driven to tap the bottom of the shaft. The level was opened on the main vein at 50, 110, 150, 210, and 350 feet, the mill crosscut being 125 feet below the latter.

The mill is in two parts, ten stamps on one side and a 7-foot Lane mill on the other. The ore on the stamp side passes through a jaw crusher to the bins where it is fed automatically to two Hendy 5-stamp batteries, the stamps weighing 1,350 pounds each, falling 105 times per minute with a 6¼-inch drop. The ore is crushed to 40-mesh passed over amalgamating plates, and concentrated on Wilfley and Deister tables. In the second unit the Lane is followed by 14-inch Allis-Chalmers rolls, the pulp going over plates to a Wilfley table. The concentrate from both units is shipped and the tailings stored.

The main power plant, situated on the beach, contains two 80-horsepower oil-burning boilers which furnish steam for an American Ball 180-horsepower engine. The latter drives a 160-kilowatt Westinghouse dynamo. The compressor at the mine has a capacity of 620 cubic feet of free air per minute and is driven by a 100-horsepower motor. Underground, Sullivan and Ingersoll-Rand machines are used.

KENNECOTT COPPER CORPORATION.

The Bonanza mine, known locally as the Beatson or Latouche property, is owned by the Kennecott Copper Corporation. The property is situated at Latouche on the western side of Latouche Island near the northern end. The ore is chalcopyrite in an altered slate and graywacke associated with considerable pyrrhotite. The mine has been opened by a main-haulage level, with crosscuts through the ore body; a 100-foot level below this, three bluff levels at varying intervals above, and a glory hole. The latter is roughly 100 by 400 feet in extent and is connected by raises to the haulage level, as are the bluff levels above.

During the summer the bulk of the ore mined is blasted from the face of the bluff into the glory hole, where it is bulldozed and drawn through to the haulage level. When the weather becomes too inclement to work outside the ore is drawn from stopes underground, which are worked on the full-breast system, only enough ore being drawn from the stope to give headroom for the machines. The broken ore passes over heavy grizzlies through bulldozing chambers before it enters the chutes and is reduced to a convenient size before being drawn into the cars. Some of the ore is shipped direct to Tacoma but the larger portion goes to the concentration plant.

In the mill the ore passes from a rotary coarse crusher to a Symons disk machine from which it is distributed by a conveyor belt to the bins. From these it passes to a Marcy mill, where it is ground to 40 mesh. It is next classified, the oversize going to Hardinge mills after which it unites with the undersize and passes to the flotation units. Following these is a Dorr thickener and an Oliver filter press, the concentrate being dried in a Ruggles-Cole drier before it is shipped to the smelter at Tacoma. The plant has a capacity of 750 tons per 24 hours but this is to be doubled in the near future.

The steam plant consists of three 305-horsepower Erie City water-tube boilers, using crude oil for fuel, which is stored in one 5,000 and one 25,000 barrel tank. Two 625 Westinghouse-Parsons turbines supply electricity for the mill and mine pumps.

Several types of Ingersoll-Rand and Sullivan machines are used underground, the air being supplied by an Ingersoll-Rand two-stage compressor, which has a capacity of 720 cubic feet of free air per minute. The latter is driven by a 122-horsepower McEwen engine.

LANDLOCK BAY COPPER CO.

The company owns a group of seven lode claims on the south side of Landlock Bay. The four ore zones, chalcopyrite, occupy shear zones through slate, graywacke, and greenstone. On the west side of the ridge on which the claims are located, two crosscuts have intersected the ore, and shallow winzes are sunk on the ore bodies. A wharf and 800-ton bunkers have been constructed near the entrance to the lower crosscut, which is about 80 feet above the sea level.

MINERAL KING MINING CO.

The company has been installing a 10-stamp mill this season at its property about a mile east of Bettles Bay, on Port Wells. There are three gold-bearing veins on the property, but except for a few open cuts the exploration work has been confined to one. This vein, which cuts a slate-graywacke series, strikes N. 40° W. and dips 53° NE. Its width varies from 6 inches to 4 feet, with an average of 18 inches. A shaft has been sunk 110 feet on the ore and drifts run on the vein about 200 feet from the 100-foot point. The property is equipped with a 16-horsepower boiler and a 12-horsepower hoist. The mine is at an elevation of 700 feet and a mill site has been staked on the flat near tidewater, where water is available for power.

RAMSEY-RUTHERFORD MINING CO.

The company is operating a high-grade lode gold property, about 11 miles northeast of Valdez. The property is situated on a ridge east of the main Valdez glacier, at an elevation of 3,500 feet. The ore vein varies from 1 to several feet in width, strikes northwest and dips 70° to 80° NE. It was originally opened with a shaft and crosscut to one of the upper levels. Since that time a crosscut on the level of the mill has been driven 742 feet to tap the vein at the 300. Levels are now opened on the 50, 100, 150, and 300 foot points, all the ores passing down the main raise to the crosscut level, whence it is trammed to the mill.

At the mill the ore passes over a 1½-inch grizzly, the oversize going to a 7 by 9 inch Blake crusher, driven by a 10-horsepower Foos gasoline engine. From the bins the ore is fed to a 5-stamp Hendy mill by a Challenge feeder and is crushed to 40 mesh. The stamps weigh 1,000 pounds each, have a 6-inch drop, and fall about 110 times a minute. The pulp flows over amalgamating plates to a Diester table, which is driven by a 3-horsepower gasoline engine.

Power is furnished to the stamps by a 20-horsepower Foos engine. Another 20-horsepower Foos drives a 9 by 11 inch compressor to furnish air to the machines underground.

REYNOLDS ALASKA DEVELOPMENT CO.

The company operates the Iron Mountain property at Horseshoe Bay, on Latouche Island. The lode is a large low-grade copper-bearing ore body which strikes N. 30° E. and dips 65° W. It has been opened by three drifts and a 2-compartment vertical shaft, which is down 110 feet. A hydroelectric plant developing 100 kilowatts supplies power for the hoist, compressor, pump, and lighting.

SEA COAST MINE.

A 10-stamp mill, hydroelectric plant, and aerial tramway were erected at the Sea Coast gold property on Shoup Bay by parties who had a bond on the ground but who gave up their option late in the season.

SEALEY-DAVIS MINING CO.

The company owns a group of 13 lode claims, bordering on the eastern shore of Shoup Bay, about 14 miles from Valdez. The ore body, a gold-bearing fissure vein which cuts a slate-graywacke series, strikes N. 50° W. and dips 61° SW. It has been opened by a 60-foot open cut, two drifts, and a crosscut, giving a total depth of about 450 feet on the vein. The average width of the vein throughout the workings is about 42 inches.

SWEEPSTAKE MINING CO.

The Sweepstake group is situated at the upper end of College Fiord, a long arm at the northern end of Port Wells. The company has run a drift 150 feet on the gold-bearing quartz lode, which varies from 18 inches to 4 feet in width. The strike is N. 65° W., the dip practically vertical, and the elevation of the drift 750 feet. The country rock is slate and graywacke.

An 1,800-foot balanced aerial tram and a mill were under construction at the property this fall. The buckets will have a capacity of 500 pounds each. The mill is a two-stamp, three-face discharge Hammond Manufacturing Co. plant, the stamps weighing 1,250 pounds each. The pulp will be passed over amalgamating plates to concentrating tables.

THOMAS-CULROSS MINING CO.

The company is operating a group of six lode claims on Culross Island, at Thomas Bay, though the work this year has been greatly hampered by litigation. The vein is quartz, carrying gold, silver, chalcopyrite, and galena, and varies in width from 1 to 5 feet. It is nearly vertical and strikes N. 15° E. A number of open cuts have been made along the outcrop and a crosscut driven 150 feet to intersect the vein along which a drift has been run 250 feet. This season the company has been installing a 10-foot Lane mill on the beach and a tram to connect the mine and plant, which will be driven by water power.

THREE MAN MINING CO.

The company owns about 40 lode claims, tributary to Landlock Bay. The main group, known locally as the Dickey claims, is at the head of the bay; the Alaska Commercial group is a little to the west of these, and the Montezuma group is on Copper Mountain.

The ore bodies at the Dickey group lie in shear zones in a slate-graywacke-greenstone series, have a general west-northwest strike, and dip 45° to 90° north. They have been opened on five levels, with over 2,000 feet of development.

The ore is carried on a short jig-back aerial tram from the lower openings to the bunkers on the wharf. The bunkers have a capacity of 800 tons.

VALDEZ GOLD CO.

The Cameron-Johnson Gold Mining Co. has been reorganized as the Valdez Gold Co. The property consists of 23 lode and 3 placer claims, about 4½ miles from Shoup Bay in an air line, and 20 miles from Valdez by way of Shoup Bay. The claims are situated in a glacial valley formerly occupied by an arm of the Shoup Glacier.

A number of veins have been discovered on the property, both in the valley and on the ridge above it, and a deep crosscut has been started to intersect these. An aerial tram and 10-stamp mill have been installed.

VALDEZ MINING CO.

The Valdez Mining Co. let contracts for the performance of the assessment work on its property, which is several miles north of Valdez, on the western side of the Valdez Glacier.

YUKON BASIN.[a]

FAIRBANKS DISTRICT.

The Fairbanks district was visited during June and July and 81 placer mines and 10 quartz mines were inspected. There were 650 men employed. In addition to the mines visited there were several other smaller operations on creeks in the district which would possibly bring the number of men employed in the mines up to 800. The value of the gold output was $1,775,000, of which $1,725,000 was recovered from the placer mines and about $50,000 from the quartz lodes. The distribution of the output was about as follows:

Chatanika, Cleary Creek, and tributaries	$325,000	
Fairbanks Creek	200,000	
Little Eldorado	120,000	
Dome Creek	175,000	
Pedro and Twin Creeks	225,000	
Goldstream and Engineer Creeks	300,000	
Ester, Gold Hill, Happy, and St. Patrick Creeks	250,000	
Vault Creek	40,000	
Gilmore Creek	40,000	
Smallwood, Fish, Big Eldorado, and other local creeks	50,000	
Gold from quartz lodes, Fairbanks region	50,000	
		$1,775,000
Other districts whose trade and gold are handled through the Fairbanks banks:		
Hot Springs	$750,000	
Tolovana	700,000	
Tenderfoot, Kantishna, and outlying districts	75,000	
		1,525,000
Antimony, tungsten, and other metals, about	200,000	
		200,000
Total mineral output		3,500,000

During 14 years the Fairbanks district has produced gold to the value of about $69,800,000, of which the placer mines have produced $68,740,000. Lode mining was begun in 1910 and since that time has produced gold to the value of $1,118,000. Other minerals produced in the district are antimony, tin, scheelite or tungsten, silver and lead, having a total value of about $312,340. Antimony was first produced commercially during 1915 and scheelite during 1916. The first shipment of lead ore was made during 1916. Tin has been recovered from the gold placers in the Hot Springs district since 1913.

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[a] Report of the Territorial mine inspector for the calendar year 1916, pp. 31–40.

During the mining season of 1916, 1,460 tons of antimony ore was shipped. The larger part of this was recovered from three mines, namely, the Eagle mine, at the head of Treasure Creek; the Chatam mine, near the head of Chatam Creek; and A. Friedriche's mine, on Vault Creek. Several other properties were operated in a small way during the first half of 1916. The fall in the price of antimony during the midsummer put an end to most of the antimony operations.

During the year 1916, 255 tons of scheelite ore, containing over 5 per cent tungsten oxide, were shipped by freight and 6 tons of scheelite concentrate, containing about 65 per cent tungsten oxide, were shipped by parcel post. The scheelite came from three properties.

Two small shipments of lead ore were made, totaling 24 tons, containing 3.67 tons metallic lead and 1,083 ounces of silver. These shipments were made from a property situated near the head of Cleary Creek.

Several small auriferous lode mines were operated in the Fairbanks district during 1916, and gold to the value of about $50,000 recovered. Development work was continued on a number of properties. The completion of the Government railroad and the establishing of an experimental station by the Bureau of Mines to assist in the development of the mineral industry will stimulate an interest in lode mining that is likely to develop several good producing lode mines.

TOLOVANA DISTRICT.

The Tolovana district was visited during July. Seventeen properties were being operated at the time of visit. The gold-bearing gravels are largely slate, chert, and quartz. All of the 17 properties visited were on the benches of Livengood Creek, which extended from opposite No. 1 below Discovery to No. 17 above Discovery, a distance of about 3 miles. There were several smaller operations on Lillian, Ruby, Amy, and Olive Creeks and prospecting on Mike Hess Creek. All of the smaller operations were closed at time of visit on account of need of water for sluicing caused by lack of rain. The gold from the deep channels is dark colored and has an assay value of $18.75 to $18.90 per ounce. The total value of the gold production for this district during the year was about $700,000. Gas is encountered in the deep placer mines of this district. One man lost his life on Mike Hess Creek and three were burned by the ignition of gas on Livengood Creek.

Timber is plentiful along the Tolovana River. Two sawmills situated at West Fork furnish all of the lumber needed in this district. The timber on Livengood Creek is small and scrubby. About 250 men were employed in this district.

HOT SPRINGS DISTRICT.

The Hot Springs district was visited during July. About 16 placer mines, employing some 300 men, were operated in this district during the year. These yielded gold to the value of about $750,000. Of this Eureka Creek produced about $60,000, Woodchopper, Sullivan, and American Creeks, and their tributaries produced $690,000. In addition to gold 70 tons of tin or cassiterite ore were recovered and 58 tons shipped as a by-product from the placer mines operating for gold. The value of the tin ore was approximately $35,000, making the total mineral production of the district $785,000. The gold production for 1915 was $610,000.

CIRCLE DISTRICT.

The Circle district includes the Birch Creek district and the placers of Woodchopper and Beaver Creeks. It is estimated that gold to the value of $250,000 was produced from about 50 mines, employing some 200 men. The largest output came from Mammoth Creek, where a dredge was operated during the entire mining season. Hydraulic mining operations were continued on a number of creeks.

RAMPART DISTRICT.

Mining continued in the Rampart district on about the same scale as in recent years on Hunter, Little Minook, Hoosier, Slate, Big Minook, and Ruby Creeks. The district produced approximately $30,000.

EAGLE DISTRICT.

Mining operations were continued in the Eagle and Seventy-mile districts on about the same scale as in the previous years. About $20,000 was produced during the season 1916.

RUBY DISTRICT.

The Ruby district was visited in August and 16 properties inspected. The principal creeks are Poorman, Flat, and Spruce, in the Poorman district; and Long Creek, in the Long Creek district. Early in the season a large increase in the gold output was anticipated in this district, but the pinching, or decrease of the gold values in the pay gravel, in some of the most promising claims on Long Creek, below the margin of profitable mining, together with the extended drought during the first part of the season, curtailed the output considerably. The output for 1915 was $800,000. The estimated output for 1916 was $840,000, an increase of $40,000 over the production for 1915. The completion of the new dredge on Greenstone Creek early in the season helped materially to maintain the output. New deep-underground placer mining operations on Birch and Straight Creeks (one plant on each creek) showed considerable cassiterite or tin ore to be associated with the placer gold, but no effort was made to save it. It is not known, therefore, if there is enough to be mined commercially. The bedrock formation is granite; the overburden is 80 feet in depth, frozen. Some cassiterite ore was recovered from the placer-gold operations on Midnight Creek and shipped to Seattle. On Trail, Tamarack, Bear Pup, Tenderfoot, and Duncan Creeks mining operations were continued during the open season as in former seasons. About 300 men were employed.

The Alaska Road Commission expended during the open season about $70,000 on the Ruby-Long wagon road, which will be of inestimable value to the operators and to the development of this district. The closest mines are about 30 miles from Ruby, the nearest landing point on the Yukon River where supplies are landed. The roads in the summertime have been almost impassable, resulting in freight charges being as high as 8 and 10 cents per pound from Ruby to Long City.

MARSHALL DISTRICT.

The Marshall district is on the Yukon near its delta, and about 50 miles below Russian Mission. Gold was found in this district in 1913, but until 1916 the production was very small. In 1916 some rich placers were developed on Willow Creek, on which seven plants, employing about 200 men, were operated and produced gold to the value of $250,000. There was a great influx of prospectors to this district before the close of the summer season. The district should get a thorough prospecting during the winter of 1916–17, and some very good discoveries of placer gold may be expected. A hydraulic plant was being installed on Elephant Creek, and some work was done on Disappointment Creek, and a small amount of gold recovered. Freight and supplies for the mines are shipped via the Yukon River to Marshall.

Marshall is the principal distributing point, and is situated about 12 miles from Willow Creek. From Marshall supplies are transhipped by small boat or launch through the sloughs of the river delta to within 3 miles of the Willow Creek camps, where they are loaded on wagons and hauled along one of the poorest wagon roads in the Territory to the mines on Willow Creek. Some development work was done on the quartz claims near the head of Willow Creek.

KOYUKUK DISTRICT.

The Koyukuk district was not visited during 1916 by the inspector. The estimated production of gold for this district this season is $300,000. Of this amount, about $200,000 was taken from the deep placers of Hammond and Nolan Creeks. Linda, Gold Myrtle, and other smaller operations contributed their quota to the output. Two drills were shipped to the district during the open season. The estimated production includes the Indian River and the Chandalar districts. About 200 men were employed in the district.

IDITAROD DISTRICT.

The Iditarod district was visited during the month of August. The gold production of the Iditarod district for 1916 was about $2,000,000, an increase of $150,000, over the production in 1915.

Eleven placer mines, four steam-scraper plants, and three dredges were operated. One dredge was on Flat Creek, and one was on Otter Creek. The other dredge was installed on Black Creek by the Otter Creek Dredging Co., but operated only a part of the season. It is a 2½-cubic-foot revolving-screen flume dredge, built by the Union Construction Co. Power is furnished by two 50-hp. semi-Deisel fuel-oil internal-combustion engines, built by the Scandia Engineering Co., of Stockholm, Sweden. The two 50-hp. Union distillate engines on the Otter Creek dredge were taken off and replaced with two 50-hp. hot-bulb fuel-oil Atlas engines, built in Stockholm, Sweden.

Some of the richest placer mines in the district are situated near the top of the divide and at the extreme head of Flat, Happy, and Chicken Creeks, and can be operated only during the spring thaw or very wet weather, they being so high the drainage area is very limited. During the winter of 1915–16 snow fences were constructed on top of the divide between those creeks, causing the snow to pile up in large drifts to a depth of over 80 feet, which furnished water for sluicing on those claims until the 1st of August, thereby adding materially to the gold output. The largest operations were those of the two dredges on Flat and Otter Creeks. There were approximately 400 men employed in the district.

INNOKO DISTRICT.

It is estimated that 30 mines were operated in the Innoko district in 1916, that about 150 men were employed, and that gold was produced to the value of approximately $160,000. The principal producing creeks were Ophir, Gaines, Spruce, and Yankee. New pay was discovered on the benches, left limit of Gaines Creek, just above the mouth of Little Creek, which may prove to be of considerable importance. There was also some prospecting with drills on Moore and Yankee Creeks, for the purpose of installing dredges. A discovery of some importance was made on Boob Creek, a tributary of Madison Creek, which is a tributary of Tolstoi Creek, a tributary of the Dishna River, which flows into the Innoko River a short distance above Dishakaket. Only a few thousand dollars were produced during 1916, but indications are that a very good output can be expected during 1917. A town named Cooper was situated at the confluence of Madison and Tolstoi Creeks, which is reached in the summer time by boats up the Innoko River to the Dishna River, and thence up the

Dishna River to opposite the town of Cooper, where a landing is made and goods hauled 5 miles across country to the town on Tolstoi Creek. Tolstoi Creek is too shallow most of the open season for navigation even by a small gas boat. There should be some provision made for the construction of wagon roads into new camps.

KUSKOKWIM BASIN.

A dredge was shipped for installation on Candle Creek, in the Takotna district, or upper Kuskokwim. It was to be shipped to McGraths during the summer season and hauled from there over to Candle Creek during the spring of 1917, but owing to the breaking of the propeller shaft of the boat that was bringing the dredge machinery from Seattle to the Kuskokwim and the boat putting back to Seattle the machinery did not arrive before the close of navigation, thus delaying the installation of the dredge for one year. Good returns are said to have been obtained from Canyon and Windy Creeks; also the Aniak district, in the lower Kuskokwim Basin; and from Candle Creek, on the upper Kuskokwim Basin. The exact amount of the gold output for 1916 has not been learned, but it is estimated to be about the same as last year, $100,000. About 80 men were employed in the operation of mines in the Kuskokwim Basin.

SEWARD PENINSULA.

The Seward Peninsula mines produced gold to the estimated value of $2,900,000 in 1916, which is the same as that of 1915. In addition to the gold production there were 162 tons of tin ore valued at $81,000, 15 tons of scheelite or tungsten ore valued at $22,000, and 70 tons of antimony ore valued at $6,000, making a total mineral production for the Peninsula of $3,009,000. About 70 tons of graphite was mined, but on account of lack of transportation facilities to Nome no shipments were made.

Since 1897 the Seward Peninsula mines have produced gold to the value of $74,351,000. Most of this gold was taken from the placer mines, although from 1903 to 1907 the big Hurrah Quartz mine produced some gold and small amounts have been recovered from several lodes at different times.

The other mineral resources of the Peninsula that have been developed are the York tin deposits, first developed in 1900; the antimony deposits, first mined on a commercial scale in 1915; scheelite or tungsten ore, mined near Nome during 1916 for the first time commercially; and a small amount of copper has been shipped from Kougarok district and Pilgrim River. Some graphite has been mined in the Port Clarence and Fairhaven districts. Coal has been mined in the Fairhaven district in a small way since 1902 for local consumption. There was considerable prospecting for copper, tungsten, and gold lodes during the past year.

A corps of engineers and geologists investigated the practicability of putting in a hydroelectric power plant in the Saw Tooth Range in the Kougarok district, the purpose being to furnish power to the dredges and lode mines of the Peninsula. Investigations of the lode and gravel deposits were also made by the engineers and geologists to determine if they could dispose of sufficient power to warrant the installation of power plant. The investigations had a tendency to stimulate interest in the prospecting and development of lode mines.

There were 31 dredges operated on Seward Peninsula during the year 1916. There were dredging for gold 29 dredges and for tin two. The two tin dredges were in the York district. The gold dredges were situated as follows: Seven in the Nome district, 4 in the Solomon River, 10 in the Council district, 3 in Port Clarence district, 3 in Fairhaven, and 2 in the Kougarok district. One new dredge was installed on Glacier Creek. One of the Flodin dredges moved from Solomon River to Canyon Creek in the Casadepaga River section. Another one of the Flodin dredges was purchased by O. W. Flowers and operated for a part of the season on upper Solomon River and later in the season was dismantled preparatory to moving during the winter 4 miles lower down Solomon River. The Mystery Creek dredge was purchased by the Northern Light Mining Co. and moved from Mystery Creek to Ophir Creek in the Council district. The Warm Creek dredge, which was idle during 1915, was changed from a revolving screen dredge to a flume dredge and operated a part of the season on Warm Creek. The dredges of the Nome Consolidated Mining & Development Co. were idle during 1916. This company has three dredges in the Nome district. The one on the third beach, or No. 8 Cooper, was dismantled during the summer and fall. Extensive alterations are planned in the reconstruction of the dredge; also the completion of the Flat Creek dredge which has been partly built ever since 1911. There were 16 idle dredges in Seward Peninsula during 1916. Some are idle for the reason that the productive placer ground has been worked out and the cost of moving a machine as large as a dredge any distance without dismantling it is prohibitive. The work of dismantling, rebuilding, and hauling over almost impassable roads is more expensive than purchasing a new dredge that is fitted to the ground, as nearly every creek or piece of dredgeable ground has different characteristics either as to depth or formation. A dredge that is suited to one piece of ground would be practically worthless on another of different formation and character. One of the most important things in building a dredge is to know the depth and character of the ground desired to be dredged. It may mean the difference between success and failure of a gold-dredging enterprise.

About 65 deep placer mines and 30 open-cut plants were operated on the Peninsula during 1916. The placers developed on Dime Creek, a tributary of the Koyuk River in the Council district, which was discovered during 1915, have yielded gold to the value of $150,000 this year. Most of this was extracted during the winter. Reported rich strikes on the benches of this creek during the summer have caused added activity to this camp and a material increase in the gold output may be expected for 1917. Sweepstake Creek, another tributary of the Koyuk River, has been a steady producer for several years and still adds its quota to the gold output of the Council district. The 10 dredges in the Council district have produced about $600,000. Placer mining in the Kobuck region during 1916 continued. The output was about $15,000.

The mines of Seward Peninsula employ about 1,100 men. It is very hard to get the exact number for the reason that there are so many engaged on small open-cut or hydraulic operations in remote parts of the Peninsula, where it is impracticable for the inspector to visit. In view of the vast territory to be covered in a limited season, he is obliged to confine his inspection to the principal mining centers. These small operations are, however, conducted on such a scale as to involve little risk of serious accidents.

There was an abundance of rainfall during the mining season which was favorable to hydraulic mining and helped to increase the output of the larger hydraulic operations as well as to stimulate operations on a number of smaller creeks which are neglected during dry seasons.

The inaccessibility of a large part of the Peninsula through lack of transportation facilities is very discouraging to prospectors. While the Alaska road commission has done good work with the small amount of funds allotted to it, yet there should be more and better wagon roads. This is of the greatest importance to the development of the mineral resources of the Peninsula. A wagon road from Nome to Candle through the center of the Peninsula would be of inestimable value. The cabins erected along the trail between Dahl Creek, in the Kougarok, and Candle with the moneys received from the Territorial fund were a great benefit to the traveling miners coming to Nome to take the last boats to the States.

On account of the extremely stormy weather during the latter part of 1916 no boats were able to sail to the Kotzebu Sound, as only small gasoline launches make the trip with the exception of one or two freight steamers which take in supplies during the summer and they are not allowed to take passengers, although some of them have accommodations for 50 or more. The custom officers, however, will not allow steamships to take passengers when they have gasoline aboard and that was a part of the steamers' cargo. This was being supplied to the dredges in that locality. Peculiarly, though, a small gasoline launch, loaded with gasoline from stem to stern and hardly seaworthy, can take all the passengers that can climb aboard. As many as 52 have been on launches that did not have accommodations for 10. But such launches are welcome conveyances compared to walking across the country, it taking three days to walk from one road house to another. Some provision should be made allowing large steamships on that northern run to take passengers between Nome and those extreme northern towns.

A road from Davidson's landing, on Marys River, to Taylor Creek would be of great value to the upper Kougarok. The road is already there but is impassable during the summer season. A very good road has been constructed by the Alaska Road Commission along the right limit of Solomon River from the ocean beach to East Fork, on Solomon River, a distance of about 12 miles. With very little added expense and work a good wagon road could be built from East Fork to Council and along the beach from Bonanza River to Nome, which would serve as an auto-truck road and greatly benefit the mining industry of that section. The road around Cape Nome was built during the summer of 1915 from the money received from the Territorial forest fund and has been of great assistance to the operators of the Solomon River and Council districts during the summer, as the extremely stormy weather made travel by boat from Nome to Solomon impossible most of the season. Owing to dredges being made up of very heavy machinery, the moving of them from one locality to another is quite impossible without roads. The construction of a wagon road, therefore, from Candle to the Kugruk River is very much needed, as the coal fields located there are o importance to the operators.

ACCIDENTS.

A fairly accurate estimate of all the men working about mills, dredges, quarries, lode, and placer mines in the Territory gives a total of 9,118, of whom 4,194 are employed in the lode mines, mills, and quarries and 4,924 about the placer mines and dredges. In the lode mines approximately 2,796 are underground and 1,398 are surface employees. In the placers the number of both surface and underground men approximate 50 per cent of the whole. Of the surface employees at the lode mines, about 925 were engaged in mills or metallurgical plants.

The mining operations throughout the Territory are so scattered and the facilities for traveling so limited that it is impossible for the Federal inspector's office, with its meager personnel, to cover the districts more than superficially, hence the collection of data relating to mine accidents depends largely on the care of the operators in sending in reports. In presenting data thus gathered, there is a tendency to exaggerate the number of accidents at mines under the control of operators who report all accidents and to minimize those at mines where the operator neglects to make the proper reports.

The information covering fatal accidents is fairly accurate for all branches of the industry; that for serious accidents is representative for the lode mines but poor for the placers; and that for slight accidents fair for the lode properties but absolutely lacking for the placers. For the sake of greater accuracy in tabulating this information, the totals for serious and slight accidents are taken from the annual reports, which differ slightly from the totals of the individual reports. The accidents were distributed as follows:

Accidents at mines in Alaska during 1916.

Fatalities:	
Lode mines—	
Underground	19
Surface	3
Total lode	22
Metallurgical plants	0
Placer mines—	
Underground	5
Surface	2
Total placer	7
Total fatalities	29
Serious accidents:	
Lode mines—	
Underground	116
Surface	[a] 50
Total lode	166
Metallurgical plants	18
Placer mines—	
Underground	15
Hydraulicking	2
Dredging	7
Total placer	24
Total serious accidents	208
Slight accidents:	
Lode mines—	
Underground	331
Surface	[a] 135
Open pit	1
Total lode	467
Metallurgical plants	109
Placer mines	
Total slight accidents	576

The accident ratios, figuring the lode mines as operating the entire year, and the placer mines as operating 6 months, are as follows:

In lode and placer mines	fatalities per 1,000 men employed	3.180
In lode mines, underground	do	6.795
In lode mines, surface	do	2.146
In placer mines, underground	do	4.062
In placer mines, surface	do	1.625

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[a] Exclusive of metallurgical plants.

In lode mines, underground	serious per 1,000 men employed	41.487
In lode mines, surface (exclusive of metallurgical plants)	do	105.708
In metallurgical plants	do	19.459
In lode mines, underground	slight per 1,000 men employed	118.383
In lode mines, surface (exclusive of metallurgical plants)	do	285.412
In metallurgical plants	do	117.838

The ratios for serious and slight accidents at the placer mines are not given, as they would be misleading on account of their incompleteness.

It is impossible to place the exact responsibility for mine accidents. The classification used by the inspectors of the Union of South Africa has been adopted for this report, as shown in the following table, the percentage error of which is comparatively small:

Responsibility for accidents in Alaska during 1916.

Item No.	Cause of accident.	Fatal.	Serious.
		Per cent.	*Per cent.*
1	Danger inherent to work or misadventure	51.724	42.038
2	Defective plant or material	3.448	6.369
3	Fault of injured person:		
	(*a*) Carelessness	20.69	40.127
	(*b*) Ignorance	3.448	
	(*c*) Disobedience of orders	6.897	.637
4	Fault of management	10.345	1.274
5	Fault of foremen		1.274
6	Fault of others (fellow workmen)	3.448	5.096
7	Joint fault of items 3, 4, 5, and 6		3.185
	Total	100	100

The proportion of accidents due to carelessness, both fatal and serious, is shown to be very large. Large as these figures seem, they are probably too small, as many of the accidents due to falls of rock had to be classified under "Danger inherent to work," whereas if complete data had been available it would be shown that they could have been avoided by proper caution. If foremen and other men occupying responsible positions were required to hold certificates of competency which could be revoked for cause, the accidents due to careless methods would be minimized.

RECOMMENDATIONS.

The following recommendations are offered as a means of reducing the number of accidents and improving conditions in the mineral industry throughout the Territory:

RULES GOVERNING 10-ACRE LEASES NEEDED.

Rules and regulations governing the operation of mines on land covered by the free-use 10-acre permits should be issued and before a permit is granted the applicant should supply evidence that he is familiar with the operation of coal mines and their ventilation or that he will place a competent man in charge.

APPROPRIATION FOR SURVEYING COAL LAND NECESSARY.

Isolated tracts of coal lands not covered by present surveys should be surveyed. Under the present law an operator can obtain only 10 acres of coal land outside the surveyed areas and this under the restriction that the coal mined shall be used locally. A specific instance of the need of surveys is afforded by the Happy Valley Coal Co., which obtained a free-use 10-acre permit to mine coal on a tract of land near Bluff Point, on Cook Inlet, and made application for a larger lease that it might open a mine large enough to supply coal to empty freight vessels returning to Portland, Oreg. The application had to be denied as there were no funds available for a survey, although these surveys are authorized by the coal leasing act of 1914. In consequence the company was restricted to a local market, vessels were deprived of return freight, and the coast market denied a cheap fuel.

BUREAU OF MINES INSTRUCTION SHOULD BE EXTENDED TO ALASKA.

The Bureau of Mines should have specific authority to assign first-aid miners to the Territory of Alaska in order to offer the miners of this Territory the same advantages as those in the States. The remoteness of many of the mines and the lack of facilities for rapid travel make this doubly necessary.

DEPUTY INSPECTORS SHOULD BE APPOINTED.

The appropriation to the Bureau of Mines for mine inspection in Alaska should be increased to provide for office rental, the purchase of technical equipment, and the employment of at least four deputy inspectors.

TABLE 1.—*Accidents in all Alaskan metal mines and metallurgical plants during the year ended Dec. 31, 1916.*

METALLURGICAL PLANTS (ORE-DRESSING AND MILLING).

	Killed.	Seriously injured. (Time lost, more than 14 days.)	Slightly injured. (Time lost, 1 to 14 days.)
Number killed or injured by—			
1. Haulage system (cars, motors, etc.)	....	3	14
2. Railway cars or locomotives	....	....	1
3. Crushers, rolls or stamps	....	5	19
4. Tables, jigs, etc	....	....	1
5. Other machinery	....	3	15
6. Falls of persons	....	2	4
7. Suffocation in ore bins	....	....	....
8. Falling objects (rocks, timbers, etc.)	....	....	6
9. Cyanide or other poisoning	....	....	1
10. Scalding (steam or water)	....	....	1
11. Electricity	....	1	....
12. Hand tools, axes, bars, etc	....	2	6
13. Nails, splinters, etc	....	....	6
14. Flying pieces of rock from sledging or crushing	....	....	2
15. Other causes	....	2	33
Total number killed or injured at mills	....	18	109

TABLE 1.—*Accidents in all Alaskan metal mines and metallurgical plants during the year ended Dec. 31, 1916*—Continued.

METAL MINES.

	Killed.	Seriously injured. (Time lost, more than 14 days.)	Slightly injured. (Time lost, 1 to 14 days.)
Underground.			
Number killed or injured by—			
1. Fall of rock or ore from roof or wall	10	25	59
2. Rock or ore while loading at working face or chute		19	47
3. Timber or hand tools		14	22
4. Explosives	3	8	5
5. Haulage system (mine cars, mine locomotives, breakage of rope, etc.)		17	40
6. Falling down chute, winze, raise, or stope	3	8	14
7. Run of ore from chute or pocket	1	4	13
8. Drilling accidents (by machine or hand drills)		15	30
9. Electricity			3
10. Machinery (other than locomotives or drills)		1	5
11. Mine fires			
12. Suffocation from natural gases	1		3
13. Inrush of water			
14. Nails, splinters, etc		1	10
15. Other causes		16	76
Total number killed or injured underground	18	128	327
Shaft accidents.			
Number killed or injured by—			
16. Falling down shafts	3		
17. Objects falling down safts			1
18. Breaking of cables			
19. Overwinding			
20. Skip, cage, or bucket	2	1	2
21. Other causes	1	2	1
Total number killed or injured by shaft accidents	6	3	4
Surface accidents. (At surface yards and shops.)			
Number killed or injured by—			
22. Mine cars or mine locomotives, gravity or aerial trams			7
23. Railway cars and locomotives	1	10	8
24. Run or fall of ore in or from ore bins			2
25. Falls of persons	1	9	8
26. Nails, splinters, etc		1	9
27. Hand tools, axes, bars, etc		1	22
28. Electricity	1	1	3
29. Machinery		5	11
30. Other causes	2	23	65
Total number killed or injured by surface accidents	5	50	135
Open-pit accidents.			
Number killed or injured in pit by—			
31. Falls or slides of rock or ore		1	1
32. Explosives			
33. Haulage system (cars, locomotives, etc.)			
34. Steam shovels			
35. Falls of persons			
36. Falls of derrick, booms, etc			
37. Run or fall of ore in or from ore bins			
38. Machinery (other than locomotives or steam shovels)		3	
39. Electricity			
40. Hand tools		1	
41. Other causes		4	
Total number killed or injured by open-pit accidents		9	1
Grand total, metal mines	29	190	467

NOTE.—The number of widows reported as due to the 29 fatalities was 6, whereas the number of orphans under 16 years was 24. Of the 208 serious injuries, 3 were permanent total disability and 13 permanent partial disability. The slight injuries at the placer mines were not reported, hence are not included in this table.

TABLE 2.—*Fatalities in lode mines in Alaska*

Date of accident.	Name of person.	Nationality.	Occupation.	Age.	Married or single.	Dependents.	
						Widow.	Children under 16 years.
Jan. 3	Eugene M. Kelly	American	Machineman	40	Married	Yes	3
4	Domenico Ciotta	Italian	Miner	41	do	do	4
4	Guio Guizzo	do	do	29	Single		
16	Ernest Gost	Greek	do	26	do		
Mar. 17	James Gunn	English	Driver	33	do		
21	Emil Oswald Heinze	German	Mucker	50			
22	Joseph Vizzetti, sr	Italian	Machineman	51	Married	Yes	5
31	Gus P. Clarey	American	do	26			
Apr. 19	Arnold C. Bonsdorff	Dane	Laborer	34	Single		
27	Joe Kosich	Austrian	Machineman	26	do		
July 1	Oscar Johnson	Swede	Shift boss	33	do		
13	Nik Krinis	Greek	Bulldozer	47	Married	Yes	5
15	Rune Carlson	American	Motorman	22	Single		
Aug. 4	Nick Olson	Russian	Skip tender				
7	Christofer Christoferson	Norwegian	Miner	28	Single		
13	Fred Mattson	Finlander	Trammer and cager.	23	do		
15	Joseph Gretland	Norwegian	Miner	28			
Sept. 6	Ole Roen	do	Machineman	22	Single		
Oct. 25	Gus Vos	Hollander	Steel worker	30	do		
26	A. Sheboff	Russian	Mucker	23	do		
Nov. 30	Louis Tremantine	Italian	Miner	49	Married	Yes	5
Dec. 14	H. D. McClellan	American	Lineman	37	do	do	2

TABLE 3.—*Fatalities in placer mines in Alaska*

Date of accident.	Name of person.	Nationality.	Occupation.	Age.	Dependents.
	Alex Woodside	Scotchman	Operator		None
May 10	Michael Pasich	Hungarian	Mucker	24	do
July 2	Chris Heeney	Irish	Operator	42	do
11	Albert Bjorklund	Scandinavian	do	30	do
Aug. —	Jack Seaberg	do	do	40	do
—	Oscar Erickson	Swede	Prospector		
Oct. 11	Andros Peter Theodore Anderson	Norwegian	Engineer		None

during the year ended Dec. 31, 1916.

Name of company and mine.	Nature and cause of accident.
Alaska Juneau Gold Mining Co.; Alaska Juneau.	Back broken by dirt slide while timbering portal.
Alaska Treadwell Gold Mining Co.; Treadwell.	Ciotta and Guizzo had been bulldozing in stope and started to return to gangway with powder. It had been their custom to leave bunches of powder tied with primers at head of manway raise, and in passing this powder it exploded, throwing both men into raise and killing them.
Kennecott Copper Corporation; Bonanza.	Walked over chute being drawn and was carried down with ore and smothered.
Alaska United Gold Mining Co.; 700-Foot.	Killed by fall of loose rock in drift while showing a friend through mine.
Kennecott Copper Corporation; Bonanza.	Crushed by descending timber skip while walking up incline at noonhour.
Alaska Gastineau Mining Co.; Perseverance.	Crushed by slab falling from roof while operating machine drill.
Alaska United Gold Mining Co.; 700-Foot.	Killed by fall of rock from pillar and roof while barring down.
Alaska Juneau Gold Mining Co.	While ascending stairway next tramway for hauling construction material, injured placed hand on passing car and caught either hand or sleeve, which threw him under car and crushed him.
do.	Standing above chute being drawn and was pulled down with ore and buried.
Ellamar Mining Co.; Ellamar	Injured in repairing pipe line in manway; allowed end of timber he was using for lever to project into hoisting compartment. Descending cage struck this timber and crushed his head against shaft timbers.
Alaska United Gold Mining Co.; Ready Bullion.	Had blasted hole in stope to break down slab. On returning to stope a second slab fell and crushed him.
Alaska Gastineau Mining Co.; Perseverance.	Fell into oreway; probably was attempting to bar large rock out of car.
Chichagoff Mining Co.; Chichagoff	Thrown out of skip, which was off track, and fell down shaft.
Alaska Industrial Co.; Jumbo	Fell into oreway.
Ellamar Mining Co.; Ellamar	Fell into shaft.
Mount Andrew Mining Co.; Mount Andrew.	Gretland went into another man's place after the man had gone to notify foreman it was unsafe. A rock fell while Gretland was trying to place a timber and killed him.
Alaska Juneau Gold Mining Co.	Asphyxiated by powder gas in raise.
do.	Crushed by steel plates sliding from car which he was unloading on inclined tramway.
Alaska Gastineau Mining Co.; Perseverance.	Crushed by fall of rock from side of drift while cleaning up around chute.
Kennecott Copper Corporation; Beatson.	Crushed by fall of slab from roof of stope while running machine drill.
Alaska Gastineau Mining Co.; Perseverance.	Buried beneath snow slide.

during the year ended Dec. 31. 1916.

Name of operator and mine.	Nature and cause of accident.
Watson & Woodside	Crushed in the shaft bottom by falling bucket, due to cable breaking.
Gold Hill Mining Co	While driving drift in frozen gravel, unexpected thawed ground ran and buried him.
Heeney, Pike & Miller	Crushed by fall of gravel from roof of drift.
Bjorklund & Bachner	Deceased while adjusting steam points in bottom of shaft was weakened from gas from decayed vegetation. While being hoisted he fell from chair.
Seaberg & Isler	Killed by falling boom.
Oscar Erickson	Overcome in bottom of shaft by fumes from fire set to thaw face of drift.
C. E. Kimball Co.	Fell from scow crossing from river bank to dredge; drowned.

TABLE 4.—*Serious accidents on surface about lode mines*

Date of accident.	Name of person.	Nationality.	Occupation.	Age.
Jan. 6	Earl Denham	American	Drill sharpener	30
20	Chris Johnson	Norwegian	Laborer	24
Feb. 7	Ben Dahl	do	Feeder	25
10	Joseph F. Zace	American	Laborer	43
12	Mike Moor	Belgian	do	42
15	George Petersen	Swede	do	32
Mar. 4	John Mackanen	Finlander	Millman	46
15	George Martin	Hungarian	Chuteman	30
18	George Atkinson	English	Laborer	32
20	Chester Leonhardt	American	Millman	19
20	Fred Christensen	Norwegian	Laborer	25
28	J. E. Steers	American	Fireman	46
Apr. 2	Thomas Murphy	do	Laborer	30
2	Peter Viano	Italian	do	28
20	F. J. Samson	German	Mucker	51
May 3	Ed R. Evans	American	Crusherman	27
6	B. M. Rice	do	Laborer	21
7	Charles Slaymaker	do	do	40
10	G. J. Cassidy	do	Donkey engineer	46
17	John McCarthy	do	Mucker	52
24	E. J. Sliter	do	Laborer	46
29	Bob Rosandich	Austrian	do	25
31	Einas Sjolund	Finlander	Mucker	21
June 5	David A. Wheeler	American	Laborer	29
12	Lou McDonald	do	do	31
July 15	Herman Hugh	Swiss	do	22
Aug. 3	Otto Stewart	do	Steel sharpener	38
18	A. A. Squires	do	Flume tender	65
Sept. 4	Tury Saks	Russian	Laborer	36
7	Jess Coddington	American	Gripman	23
20	George N. Peterson	Dane	Mill oiler	24
Oct. 2	E. I. Whitmore	American	Skip operrator	40
23	Olaf Jamne	Norwegian	Painter	40
30	Battista Bobzadelli	Italian	Concentrator	30
Nov. 19	Frank Ross	American	Electrician	25
Dec. 19	Steve Vukovich	Montenegrin	Mucker	27

in Alaska during the year ended Dec. 31, 1916.

Name of company and mine.	Nature and cause of accident.
Alaska Mexican Gold Mining Co.; Mexican.	Third and fourth fingers of left hand crushed. Rested hand underneath hammer of drill sharpener and accidentally turned on the air.
Alaska Juneau Gold Mining Co.; Alaska Juneau.	Bruised and cut about head. Fell from dock while unloading lumber.
Alaska Treadwell Gold Mining Co.; Treadwell.	While changing cam shaft the shaft fell off horses and a cam slipped off, crushing big toe on right foot.
.....do.	Abscess on right hand, due to infected cut.
Alaska Juneau Gold Mining Co.; Alaska Juneau.	Fell while carrying steel on mill grade and broke small bone in ankle.
Alaska Gastineau Mining Co.; Perseverance.	End of index finger on left hand crushed while moving drill sharpener off track. Accidentally placed finger under hammer as machine was turned over and it fell on finger.
Alaska United Gold Mining Co.; 700-Foot.	Left ankle bruised by falling stamp while making repairs in mill.
Alaska Gastineau Mining Co.; Perseverance.	Injured was on running board of locomotive, which backed up against train, catching left foot between drawheads and bruising it badly.
Alaska Juneau Gold Mining Co.; Alaska Juneau.	Resting hand on bowlder when one rolled down from above and broke two bones in right hand.
Alaska Gastineau Mining Co.; Perseverance.	Attempted to stop moving belt; left arm was jerked between pulley and belt and broken.
Alaska Juneau Gold Mining Co.; Alaska Juneau.	Struck by broken cable on donkey engine; sustained a broken collar bone and two scalp wounds.
.....do.	Burned on right eye by hot scale while cleaning boiler.
Alaska Treadwell Gold Mining Co.; Treadwell.	Riding on load of baled hay when one bale struck platform and threw him onto rocks below. Right arm fractured, right hip sprained, and head cut.
Alaska United Gold Mining Co.; Ready Bullion.	Fell from platform while throwing down timbers and fractured skull.
Alaska Juneau Gold Mining Co.; Alaska Juneau.	Bruises on back, internal injuries. Preparing blast on mill grade when a rock rolled down from above and struck him on back.
.....do.	Middle finger of left hand cut and bruised at end. Injured was prying piece of steel from grizzly plate when bar slipped, causing him to fall and catch his finger between the bar and a bolthead.
Alaska Gastineau Mining Co.	Left leg broken at ankle. Injured attempted to shift belt from high-speed to intermediate pulley with his foot and was caught between belt and pulley.
Alaska Treadwell Gold Mining Co.; Treadwell.	One bone in left leg broken. Caught between drawbar of locomotive and car while attempting to couple them.
Alaska Juneau Gold Mining Co.; Alaska Juneau.	Left ankle caught between planks and bruised while moving donkey engine from wharf onto barge.
.....do.	Right ankle bruised. While pushing car the car bumped at end of track and backed a foot or two; injured fell on track and car-bumper passed over ankle.
.....do.	Ankle and foot bruised by falling plank while working pile driver.
.....do.	Right leg bruised. Injured was trying to put dump car on track when car slipped and fell on him.
.....do.	Both ankles bruised. Injured was thrown over dump by car turning over as he attempted to dump it.
.....do.	Left arm crushed; amputation necessary. While helping change cable from bottom to top of drum on small hoist at incline tramway, arm was caught in loop of cable.
.....do.	Right thumb bruised while loading steel on truck.
Alaska Free Gold Mining Co.	Mitten caught in saw. Palm cut.
Alaska Gastineau Mining Co.; Perseverance.	Struck left hand with hammer, causing slight abrasion which became infected.
.....do.	Cut over left eye and body bruised. Thrown from car when horse shied, throwing car off track.
Alaska United Gold Mining Co.	Two bones broken in left leg and chest bruised. Shifting belt from line-shaft pulley; caught in belt and thrown to floor.
Kennecott Copper Corporation; Jumbo.	Fracture, left arm. Injured stopped tramway to tighten bucket grip; fastened bucket with rope which failed to hold when grip was loosened, and was knocked to the ground.
Kennecott Copper Corporation	Lost third, fourth, and fifth fingers and portion of left hand. Fingers drawn into bevel gear when injured attempted to put grease on gear with his hand.
Alaska Gastineau Mining Co.	Right elbow dislocated, right hand bruised, and left hand so badly crushed that amputation was necessary. Injured was moving conveyor-dumper when his hands caught between rope and "niggerhead" on "gypsy."
Alaska Juneau Gold Mining Co.	Left arm broken at shoulder and wrist by fall from roof of mill.
.....do.	Head, jaw, and wrist bruised while attempting to move belt from pulley.
Alaska Gastineau Mining Co.	Sprained right ankle. Slipped on mat at foot of stairs in mill.
Alaska Juneau Gold Mining Co.	End of thumb on right hand crushed. Injured attempted to remove rock from wheel which he used to block the car and the wheel pinched his thumb.

TABLE 5.—*Serious accidents underground in lode*

Date of accident.	Name of person.	Nationality.	Occupation.	Age.
Jan. 4	Joseph Succa	Italian	Machineman	29
5	Joseph Sandona	do	Machine helper	28
6	Ed More	Belgian	do	26
9	E. Johnson	American	Mucker	21
9	R. A. Barnes	do	Machine helper	50
11	Ray Gossett	do	do	32
11	John Varlamos	Greek	Bulldozer	35
31	John Bogdanovich	Austrian	Mucker	42
Feb. 2	Mike Cook	Russian	do	40
4	Louis Welvert	Belgian	Steel packer	23
8	M. H. Gedney	American	Foreman	60
13	James Zeoff	Russian	Mucker	30
16	Mike Zugic	Montenegrin	Machineman	24
18	Emelio Petrasso	Italian	Machine helper	26
26	Pietro Bonna	do	Laborer	40
29	Mike Chalovich	Montenegrin	Machine helper	35
Mar. 3	L. P. Hamilton	American	do	35
6	Math Jakominich		Machine helper	25
13	Mike Knaz	Montenegrin	do	38
14	Steven Rolando	Italian	Mucker	36
16	Gus Erickson	Swede	Contractor	28
16	Andrew Erickson	do	do	22
19	John Jarico	Italian	Machine helper	40
19	Kosta Guizino	Montenegrin	Chute puncher	37
25	Dan Sakatos	Greek	Machineman	30
Apr. 6	Louis Odolovich	Austrian	Mucker	45
10	J. M. Steele	American	Miner	45
18	Costa Caramouzie	Greek	Mucker	45
18	James Bowie	Scotch	Machineman	43
21	Peter E. Genatos	Greek	Mucker	28
24	Antonio Dalla	Italian	Bulldozer	31
29	Ralph Marcine	do	Timberman	25
May 2	Nick Demer	Greek	Bulldozer	25
4	George T. Quinge	Norwegian	Carpenter	45
5	Mike Moras	Montenegrin	Bulldozer	36

mines in Alaska during the year ended Dec. 31, 1916.

Name of company and mine.	Nature and cause of accident.
Alaska Gastineau Mining Co.; Perseverance.	Waste on which machine was set moved, and machine fell on operator, breaking both his legs.
do	Injured was standing with hand resting on machine when rock fell from roof, bruising and lacerating hand.
do	First joint, index finger, right hand, badly crushed by machine which rolled over while injured was lifting it.
Jualin Alaska Mines Co	Crushed ends of fourth and fifth fingers between a piece of ore and car. The ore protruded over top of car and caught on timber.
Alaska Gastineau Mining Co.; Perseverance.	Right foot bruised by fall of rock while carrying drill steel through stope.
Alaska Gold-Belt Co	Collar bone broken. Clothing caught in gear of diamond drill and injured was thrown against chuck nut.
Alaska Gastineau Mining Co.; Perseverance.	Rush of ore in chute while barring down. Fractured skull and badly cut and bruised shoulders.
Alaska Juneau Gold Mining Co	Two ribs broken on left side by rock falling from chute while barring down.
Alaska Gastineau Mining Co.; Perseverance.	Bone in right hand broken by fall of rock in drift.
Alaska Mexican Gold Mining Co.; Mexican.	Injured was carrying drill steel across stope and fell; steel bruised the third finger on right hand.
Ellamar Mining Co.; Ellamar	Leg broken by fall of rock in waste raise.
Alaska Gastineau Mining Co.; Perseverance.	Thumb of right hand crushed and hand lacerated. Injured attempted to hold coupling link between two cars with his candlestick, when motor bumped against them and caught his hand between the bumpers.
do	Small piece of steel from drill cut tissue of left eye.
Alaska Treadwell Gold Mining Co.; Treadwell.	Injured was climbing ladder when his partner dropped monkey wrench, which fell on the middle finger of his right hand.
Alaska United Gold Mining Co	Tip of thumb on right hand crushed by a rock which slipped while injured was unloading car.
Alaska Gastineau Mining Co.; Perseverance.	Eyes filled with dirt from small explosion caused by drilling into cut-off hole.
do	While watching car being loaded at chute, rock bounced off car and bruised left foot.
do	Jack bar slipped from column which injured was tightening and threw him down, causing a compound fracture of first phalanx of index finger.
do	Injured was carrying machine over waste pile when he fell with machine on top of him, causing a right inguinal hernia. (Old case.)
Alaska Juneau Gold Mining Co	Ruptured by strain while rolling a heavy rock.
Alaska Gastineau Mining Co.; Perseverance.	Contused and punctured wounds of right arm, chest, both hands, and upper left leg, due to flying particles from explosion caused by drilling into missed hole.
do	Contused wound of left wrist due to flying particles from explosion caused by drilling into missed hole.
do	Injured was helping lower machine when it fell off the arm, dropping on his right foot and bruising it severely.
do	Injured had been barring down in a chute. He laid bar on plank and rock fell and struck one end of the bar, throwing the other against his face, lacerating the lip and eye.
do	Injured was standing with his left hand on crossbar when rock fell from roof and crushed fourth finger between rock and bar.
Alaska Juneau Gold Mining Co	End of left index finger broken by fall of rock.
Kennecott Copper Corporation	Fell through raise from one stope to another while trying to start ore. General contusions, especially about right arm and shoulder.
Alaska Gastineau Mining Co.; Perseverance.	Clearing tracks at chute while train was loading; did not hear "go ahead" signal and was struck by car when train started. Lacerated wound of left eye, fracture of left radius, and fracture of second rib, both sides.
Alaska United Gold Mining Co.; Ready Bullion.	Climbing up raise on rope, slipped and fell. Cut head and sprained ankle.
Alaska Gastineau Mining Co.; Perseverance.	Third rib fractured while coupling cars.
Alaska Treadwell Gold Mining Co.; Treadwell.	While preparing to bulldoze rock in stope, a piece of ore rolled down pile, breaking left leg and one rib.
Alaska Gastineau Mining Co.; Perseverance.	Contusion of right foot, fracture of fourth phalange. Injured was hoisting planks in chute when one fell and struck his foot.
do	Compound fracture of inferior maxillary and lacerated wound of neck. Injured was barring down at chute when rock fell on one end of bar, which flew up and struck his jaw.
Alaska Juneau Gold Mining Co	Right hip and groin bruised. Injured was working on construction of tramway when rock rolled down the hill and struck him.
Alaska Gastineau Mining Co.; Perseverance.	Fracture of inferior maxillary, lacerated wound of right cheek and scalp. Injured was barring down at chute and had his bar over check board when ore fell on bar, which struck his jaw and knocked him off platform.

TABLE 5.—*Serious accidents underground in lode mines in*

Date of accident.		Name of person.	Nationality.	Occupation.	Age.
May	8	Otto Hocking	Swede	Chute puncher	35
	8	Thomas Griffen	Irish	Mucker	26
	9	Rista W. Lucich	Servian	Machine helper	26
	13	Joseph Rodich	Austrian	Machineman	26
	22	Thomas Basoff	Russian	Chute puncher	32
	22	Emil Kalmutsky	do	Machineman	35
	25	Jacob Nordahl	Norwegian	Pipeman	43
	25	Albert Henden	do	Machineman	30
	25	Mike Ogden	Austrian	Chute puncher	
	30	Algot Johnson	Swede	Mucker	21
June	8	John Wilson	Finlander	Machineman	27
	10	Antonio Bertolini	Tyrolian	Laborer	40
	13	Peter Perovich	Montenegrin	Machineman's helper.	39
	15	C. Garavatti	Italian	Steel nipper	26
	16	Gust E. Johnson	Swede	Rock breaker and driver.	18
	17	C. W. Carlson	American	Miner	34
	27	Peter Deibrich	Montenegrin	Chute puncher	34
	29	J. Flenor	American	Motorman	45
July	3	Samuel Aboff	Russian	Machineman's helper.	22
	7	Robert Rosandich	Austrian	Laborer	25
	10	Nick Popa	do	Machine man's helper.	40
	20	Gus James	Greek	Mucker	27
	22	Vuko Tomasovich	Montenegrin	do	23
	23	Peter M. Nikaloff	Belgian	Chute puncher's helper.	39
	25	Obren Odalovich	Austrian	Chute puncher	24
	25	Henry Jackson	Finlander	Machineman	38
	27	Christ Nick	Turk	Laborer	39
	29	James Jarden	Austrian	Cage man	29
Aug.	4	L. Watt	Scotchman	Machineman	38
	8	George Sabolek	Austrian	Hand miner	37
	12	Nick Kupoff	Russian	Chute puncher	25
	12	Mike Voinovich	Montenegrin	Laborer	29
	15	Frank Powers	American	do	20
	20	Mike Odal	Austrian	Machine man	22
	25	Alex Sagoff	Russian	Car man	22
	28	Samuel Karadish	Montenegrin	Machine man	25

Alaska during the year ended Dec. 31, 1916—Continued.

Name of company and mine.	Nature and cause of accident.
Alaska Gastineau Mining Co.: Perseverence.	Lacerated wound of left hand, compound fractures of third and fourth fingers. Injured was standing with hand on check board when rock fell on it.
Alaska Juneau Gold Mining Co.	Index finger of right hand cut and bruised. Barring down in tunnel when rock fell from roof.
do.	Instep bruised by piece of drill steel falling down manway.
Alaska Gastineau Mining Co.; Perseverance.	Ulcer on eyeball due to cut from flying piece of steel from drill while starting hole.
do.	Contusion of first toe, left foot. Injured was standing before chute when piece of ore fell over chute door and struck his toe.
Alaska Juneau Gold Mining Co.	Instep bruised by machine which fell on foot.
do.	Right thigh cut by rock blown out of air pipe while Nordahl was cleaning the line.
do.	Face and nose cut and bruised. Henden was assisting Nordahl in removing rock and dirt from the air pipe.
Goodro Mining Co.; May Group.	Rupture due to lifting excessive weight.
Kennecott Copper Corp.; Bonanza.	End of second toe, left foot, crushed by rock falling from chute.
Jualin Alaska Mines Co.; Jualin.	First finger of right hand mashed. Rock projecting from car which injured was pushing struck timbers, catching his finger between the rock and the car.
Alaska Treadwell Gold Mining Co.; Treadwell.	Head and face cut and right hip injured by falling rock in stope.
Alaska Gastineau Mining Co.; Perseverance.	Lacerated wound of left eye and contusion of left ankle. Injured was walking across stope when the broken ore moved, throwing him down and bruising him.
Alaska United Gold Mining Co.; 700-Foot.	Left leg fractured by fall of rock from roof of stope.
Alaska United Gold Mining Co.; Ready Bullion.	Collar bone broken. Injured was caught between car and chute.
Alaska Free Gold Co.	Slipped on ice in raise and fell, dislocating shoulder.
Alaska Gastineau Mining Co.; Perseverance.	Compound fracture of fourth finger of right hand. Rock fell on bar and caught finger between bar and chute board.
do.	Contused wounds of left ankle. While walking along drift, turned to look at a chute and ran into a truck.
do.	Back, legs, and shoulder injured by fall of rock in stope.
Alaska Juneau Gold Mining Co.	Back, shoulder, and left side bruised. Injured and two others were pushing loaded dump car out of tunnel when motor train came around curve and struck dump car, throwing it off track and catching injured between dump car and side of tunnel.
Alaska Gastineau Mining Co.; Perseverance.	Face and hands burned by flame from acetylene gas generated when injured poured carbide into can containing water.
Ellamar Mining Co.; Ellamar.	Right leg bruised and thigh fractured by falling in a chute.
Alaska Gastineau Mining Co.; Perseverance.	Fractured left tibia when hit by car dump which injured had just unhooked.
do.	Contusion of hips. Stepped between car and chute just as train started.
do.	Compound fracture of nose and contused wound of scalp. Injured had bar over chute board when rock fell on inside end of bar, throwing bar against his face and knocking him off the platform into the car.
Alaska Juneau Gold Mining Co.	Right eye bruised—vision impaired—by small rock falling while ascending ladder in raise.
do.	Right foot crushed. Injured was removing rocks from side of drift when ore train came up behind him. His foot jammed between a car and a piece of rock.
Alaska Gastineau Mining Co.; Perseverance.	Compound fracture of fifth metacarpal bone, right hand. Injured was raising oil tank with winch when handle broke and flew back, striking him on the hand.
do.	Index finger crushed; amputation necessary. Injured was walking with bar on his shoulder when he fell, catching his hand between the bar and a rock.
Alaska Mexican Gold Mining Co.; Mexican.	Right arm crushed: amputated below elbow. Injured went up chute to determine position to place powder to start chute when rock fell on him.
Alaska Gastineau Mining Co.; Perseverance.	Fracture of first toe, left foot. Rock rolled over chute board and fell on toe.
Alaska Juneau Gold Mining Co.	Face and eyes cut by flying rocks from explosion of a cap or piece of dynamite in the waste injured was shoveling.
do.	Third finger, left hand, badly bruised while loading steel beams on truck.
Alaska Gastineau Mining Co.; Perseverance.	Fracture of twelfth dorsal vertebra and contused wounds of scalp and face. Fall of rock in a stope.
Kennecott Copper Corp.; Bonanza.	End of third finger, left hand, lacerated by falling rock which caught injured's hand between car and bar.
Alaska Gastineau Mining Co.; Perseverance.	Contused wounds of third and fourth fingers, left hand. Injured was pulling up steel and caught hand under cable.

TABLE 5.—*Serious accidents underground in lode mines in*

Date of accident.	Name of person.	Nationality.	Occupation.	Age.
Sept. 9	Oscar Bondeson	Swede	Mucker	28
9	Nunzio Greko	Italian	Laborer	30
9	Alex Govzdenovich	Montenegrin	do	28
16	Attilio Costa	Italian	Machine man	32
16	John Yakich	Montenegrin	Mucker	33
22	John B. Larson	Finlander	Timberman and hoistman.	34
23	Lawrence Linden	American	Miner	40
29	Battista Allio	Italian	Machine man	26
Oct. 2	George Besoloff	Russian	Mucker	40
2	Charles Penn	Austrian	Machine man	29
3	E. Patzold	German	Miner	50
3	G. Tomme	Belgian	do	34
5	Thomas Tsolokas	Greek	Bulldozer	31
15	Eli Lalich	Austrian	Machine man's helper.	26
15	Mike Jelich	do	Bulldozer	45
15	George Gogoff	Russian	Chute puncher	21
19	Oscar Ness	Finlander	Machine man	29
22	Red Alechsich	Montenegrin	do	34
Nov. 3	Charles Penn	Austrian	do	29
11	Earl Rhoades	American	Machine man's helper.	23
13	W. W. Eggen	do	Motorman	22
27	Knut Danielson	Swede	Machine man	37
27	Peter Miller	Austrian	do	40
Dec. 1	Peter Batello	Italian	do	42
2	Frank Peters	Indian	Mucker	26
7	Lazo Kovacik	Austrian	Chute puncher	52
8	Ely Radovich	Montenegrin	Contractor	30
9	Ike Hall	Finlander	Mucker	27
31	Herman Lurda	do	Machine man	40

Alaska during the year ended Dec. 31, 1916—Continued.

Name of company and mine.	Nature and cause of accident.
Chicagoff Mining Co.: Chicagoff	Leg broken by fall of rock in drift.
Alaska Juneau Gold Mining Co	Head, face, and hip bruised. Overcome by powder gas and fell down chute.
.....do	Top of head cut, shoulders, back, and upper part of legs bruised. While injured was helping put skip on track the steel bar that he was using lost its hold and he fell down an incline raise about 125 feet.
Alaska Gastineau Mining Co.; Perseverance.	Lacerated wounds of second and third fingers, right hand. Column bar slipped while injured was adjusting head block and caught his fingers between bar and wall.
.....do	Contused wound of left foot caused by injured's dropping rock on foot.
Alaska Juneau Gold Mining Co	Two or three ribs broken on left side. Injured was standing on carpenter's horse setting hangers for trolley wire when the horse turned over and threw him to the ground.
Kennecott Copper Corp.; Bonanza	Two cuts on head. Rock rolled down from pile of ore thought to be frozen.
Alaska Treadwell Gold Mining Co.; Treadwell.	Left arm fractured by a piece of steel which fell down a raise while injured was setting timbers.
Chicagoff Mining Co.; Chicagoff	Lower leg broken. Injured was riding timber truck and attempted to stop same with foot.
Alaska Gastineau Mining Co	Fracture of fourth metacarpal bone, right hand. Injured was pulling on jack bar when it slipped and caused him to fall on his hand.
Jualin Alaska Mines Co	Leg bruised by fall of rock in stope.
.....do	Flesh torn from leg by hook on car. Injured was walking along drift and did not see car in time to get out of way.
Alaska Gastineau Mining Co.; Perseverance.	Contused wounds of right forearm from fall of rock in chute.
.....do	Contused wounds of first, second, and third fingers, left hand. Injured tried to start small skip stuck in a raise. It gave way suddenly and his hand caught between the skip and timbers.
.....do	Back hurt and internal injuries; fell from ladder.
.....do	Lacerated wound of index finger, right hand. Finger caught between bar and rock.
Alaska Juneau Gold Mining Co	Left eye injured by piece of steel flying from the bit of a near-by machine.
.....do	Left foot bruised by falling jack bar which injured was using in setting drift timbers.
Alaska Gastineau Mining Co.; Perseverance.	Face and head cut, muscles of neck and back sprained. Injured was thrown down by an air blast.
.....do	Felon on right index finger due to infection of wound from a sliver on a drill rod.
.....do	Left leg bruised and cut below knee. Injured ran motor into standing trip and caught leg between a car and the motor.
Alaska United Gold Mining Co.; 700-Foot.	Left leg broken below knee. Had helper loosen clamp on tripod and machine fell off, striking injured on leg.
Jualin Alaska Mines Co	Bruised leg. Fall of ground in a raise.
.....do	Bruised finger. Steel in machine broke, throwing it against wall.
Alaska Juneau Gold Mining Co	One or two small bones broken in foot. Injured was lifting rock into the car when it broke and fell on foot.
Alaska Gastineau Mining Co.; Perseverance.	Right side and both arms injured. Injured stepped off motor while in motion and grabbed the ladder, and the moving car crushed him between car and ladder.
Ellamar Mining Co.; Ellamar	Burns on face and hands, bruises on arms, legs, and body. Blown down a raise by an explosion of methane.
Alaska Juneau Gold Mining Co	Ulcer on cornea, right eye, due to bruise from flying rock.
Alaska Gastineau Mining Co.; Perseverance.	Back and right leg bruised. Motor ran into injured while standing in drift so smoky that he did not see motor approaching.

TABLE 6.—*Serious accidents in placer mines*

Date of accident.		Name of person.	Nationality.	Occupation.	Age.
Apr.	1	Axel Sandberg		Operator	
	5	Paul Schultz		do.	
	18	James O'Dea		Machinist	
	19	James Mulvehill		Laborer	45
	25	William Kelly		Operator	
	25	Samuel Lowery		Laborer	
	..	William Flater			
May	11	Adolph Holtman		Mucker	
	19	Thomas Isaacson	Finlander	Miner	46
June	1	George Getton	Russian	do.	
	..	E. Richards	English	Carpenter	42
July	10	George McFeely	Scotch	Timberman	
	14	Harvey G Dorr	German	Mucker	
	29	John Neilson		Laborer	33
Aug.	4	Daniel Dooling	American	Operator	44
	9	Carl Karleen		Engineer	
	10	Alex Kannoff	Russian	Miner	
	18	Abraham Jukko	Finlander	do.	
	..	O. W. Flowers		Operator	
Sept.	13	Louis Peterson		Pipe man	
Oct.	5	Dommick Brondino	Italian	Miner	34

in Alaska during the year ended Dec. 31, 1916.

Name of operator and mine.	Nature and cause of accident.
Kleinschmidt & Sandberg; Niggerhead Association.	Injured lost sight of 1 eye and injured the other, lost 4 fingers on right hand, had right leg broken in 2 places, and hearing affected by an explosion of dymanite and caps. He was alone at the time and did not know the cause of the explosion.
Paul Schultz	Burned and bruised by explosion caused by drilling into missed hole.
Yukon Gold Co	Accidentally struck on the head by a hammer which caused a slight wound. This later became infected.
.....do	While thawing frozen ground ahead of a dredge, injured stepped near live steam point and crust gave way, plunging his foot into hot muck and scalding his leg above the shoe top.
Kelly, Sampson & Colbert; Gold Dollar Association.	Kelly raised lighted candle to examine roof and ignited gas pocket which burned his face and hands.
.....do	Lowery was with Kelly. Face and hands were burned.
Cleveland & Howell; Mohawk	Injured was timbering drift when the gravel caved from the side and broke his leg below the knee.
Finley & Paterson; Deep Channel Association.	Leg caught between 2 large pieces of frozen gravel and crushed so badly that amputation at thigh was necessary.
Howell & Cleveland; Mohawk and Loraine claims.	Leg broken by slab of bedrock which slid out of the side of the drift.
.....do	Eye injured by piece of flying gravel.
Flume Dredge Co.; No. 1, above Melsing Creek.	While injured was assisting in unloading a line shaft from a wagon it fell and broke his leg.
August Peterson	Injured was timbering shaft when he lost his balance and fell 25 feet, straining his back.
Frank Waskey; No. 1, below Willow Creek.	Leg broken by a bowlder which fell off a conveyor in a hydraulic pipe.
Yukon Gold Co	Injured, while thawing frozen ground ahead of dredge, attempted to remove plank from steam-point hole and slipped, plunging his legs into hole and scalding them.
Dooling, McIntosh & Patterson; No. 1, below Myrtle Creek.	Bowlder fell from face of drift and struck injured on foot, breaking several small bones.
Julian Dredge Co	Injured stood on winch drum on dredge without notifying winchman, who started winch and threw injured against the clutch, lacerating thigh and calf of right leg.
Howell & Cleveland; Mohawk & Loraine.	Injured entered old workings and ignited a pocket of gas, which burned his face and hands.
.....do	Do.
O. W. Flowers's dredge	Injured thrust his hand through spokes of gear wheel to screw down grease cup when winchman, who had not been notified that anyone was working on engine, started the winch, crushing the injured's arm so badly that amputation was necessary.
Pioneer Mining Co.; Ault	Injured lost control of a nozzle which swung around and broke 2 of his ribs.
Howell & Cleveland; Mohawk & Loraine.	Eye was struck by a chip from a bowlder which he struck with his pick.

TABLE 7.—*Serious accidents in*

Dredging.						Hydraulicking.							
By machinery.	By electricity.	By boiler explosion or bursting steam pipes.	By falls of persons.	By tools.	By other causes.	By cave of bank.	By explosives.	By hydraulic giants.	By falls of persons.	By rock while handling.	By tools.	By machinery, derricks, etc.	By other causes.
1	2	3	4	5	6	7	8	9	10	11	12	13	14
......	......	......	......	......	......	......	......	......	......	......	......	......	......
......	......	......	......	......	......	......	......	......	......	......	......	......	......
......	......	......	......	......	......	......	......	......	......	......	......	......	......
......	......	......	......	1	2	......	......	......	......	......	......	......	......
......	......	......	......	......	......	......	......	......	......	......	......	......	......
......	......	......	......	......	......	......	......	1	......	......	......	......	......
1	......	......	......	......	......	......	......	......	......	......	......	......	......
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......	......	......	......	......	......	......	......	......	......	1	......	......	......
1	......	......	......	......	......	......	......	......	......	......	......	......	......
2	......	......	......	1	4	......	......	1	......	1	......	......	......

placer mines in Alaska, by causes, 1916.

Underground.									Result of injury. (Time lost more than 14 days.)			Name of company.
By fall of roof or gravel.	By timber or hand tools.	By explosives.	By falls of persons.	By haulage.	By drilling.	By hoisting.	By steam (when steam points are used).	By other causes.	Permanent total disability.	Permanent partial disability.	Temporary disability.	
15	16	17	18	19	20	21	22	23				
	1					1					2	Driscoll Bros.
		1								1		Kleinschmidt & Sandberg.
		1									1	Paul Schultz.
											3	Yukon Gold Co.
1											1	Dooling & Paterson.
											1	Pioneer Mining Co.
										1		Julian Dredge Co.
											1	
		2									2	Kelly, Sampson & Colbert.
1										1		Finley & Paterson.
2								4			6	Howell & Cleveland.
											1	Flume Dredge Co.
			1								1	August Peterson.
											1	Frank Waskey.
											1	O. W. Flowers Dredge.
4	1	4	1			1		4		3	21	

DATA ON DREDGES, LODE MINES, AND PLACER MINES.

Data on dredges, lode mines, and placer mines in Alaska for the year 1916 are presented in tables 8 to 10. Table 8 gives important details in regard to dredges. Table 9 gives the names of mines, operator, and manager, with post office address, for the lode mines of the Territory, by districts. Table 10 gives the names of placer claims and the creek on which the claim is situated, with name and address of operator, by districts.

TABLE 8.—*Data on*

Name.	Alaska address.	Creek or river.	Type.	Size of bucket.	Bucket line.
Seward Peninsula.					
				Cu. ft.	
American Gold Dredging Co	York	Anicovik	Flume	2	Open.
Do	do	do	do	1¾	Close.
American Tin Dredging Co	do	Buck			
Arctic Dredging Co	Nome	Hobson	Belt stacker.	2½	Open.
Arctic Creek Dredge[a]	do	Arctic			
Bangor Creek Dredging Co	do	Bangor	Belt stacker.	3½	Open.
Bering Dredging Co	Taylor	Kougarok			
Blue Goose Mining Co	Council	Ophir	Belt stacker.		Close.
Candle Creek Dredging Co	Candle	Candle	Flume	1¾	Open.
Center Creek Dredging Co	Nome	Center			
Ernst-Alaska Dredging Co	do	Nome Beach	Flume	1¾	Open.
Flowers Dredge	Solomon	Solomon	Bucket stacker.	2¾	do.
Flume Dredge Co	Council	Melsing	Flume	2½	do.
Do	do	do	do	2½	do.
Fries Dredging Co	Deering	Inmachuk			
Glacier Creek Dredge	Nome	Glacier			
Goose Creek Dredge	Dickson	Goose			
Hastings Creek Dredge	Nome	Hastings			
Inmachuk Dredging Co.[a]	Candle	Inmachuk	Flume	3	Open.
Johnson Dredge	do	Kugruk	do	3	Close.
Julian Mining Co	Nome	Osborne	Belt stacker.	2¾	Open.
Kelliher Dredge	Taylor	Kougarok	Bucket stacker.	2½	do.
Kimball Co., C. E	Nome	Solomon	Flume	2½	do.
Do	do	do	do	2½	do.
Moody Mining Co	do	Canyon	do	2½	do.
Northern Light Mining Co	Council	Ophir	do	2½	do.
Nome Consolidated Dredging Co	Nome	Burbon	Belt stacker.	7	Close.
Do	do	Wonder	do	7	Open.
Do	do	do	do	7	do.
Nome-Montana-New Mexico Mining & Dredging Consolidated.[a]	Solomon	Solomon	Bucket stacker.	5	do.
Oro Dredging Co	Council	Elkhorn	Flume	1¼	do.
Plein Mining & Dredging Co.[a]	Nome	Nome	Bucket stacker.	2¾	do.
Ruby Dredging Co	do	Casadepaga	Flume	2¾	do.
Seiverson & Johnson[a]	Dickson	Solomon	Bucket stacker.	2¼	do.
Seward Dredging Co	do	do	Belt stacker.	5	Close.
Shovel Creek Gold Dredging Co.[a]	do	Shovel	do	2¾	do.
Solomon Dredging Co.[a]	do	Solomon	do	3½	do.
Sunset Mining Co	Teller	Sunset			
Uplift Mining Co	Council	Camp			
Warm Creek Dredging Co	do	Warm	Flume	2½	Open.
Wild Goose Mining & Trading Co	Nome	Ophir	Belt stacker.	3½	Close.
Willow Creek Dredging Co.[a]	Dickson	Willow	do	3	Open.
Windy Creek Dredge	Teller	Windy			
York Tin Dredging Co	York	Grouse	Flume	2½	Open.
Cache Creek.					
Cache Creek Dredging Co	Cache via Susitna.	Cache	do	7	Close.
Circle.					
Berry Dredging Co., C. J	Circle	Mastodon			
Fairbanks.					
Fairbanks Gold Mining Co	Fairbanks	Fairbanks	Bucket stacker.	3½	Open.
Iditarod.					
Otter Creek Dredging Co	Iditarod	Otter	Flume	3½	Close.
Do	do	Black	do	2½	do.
Yukon Gold Co	do	Flat	Belt stacker.	7½	do.
Kenai Peninsula.					
Herron Dredging Co.[a]	Hope	6-Mile			
Ruby.					
Yukon Gold Co	Ruby	Greenstone			

[a] Not operating in 1916.

dredges in Alaska, 1916.

Maximum digging depth.	Rated horsepower.	Source of power.	Actual capacity in yards per 24 hours.	Dimensions of hull.	Manager.
Feet.				*Feet.*	
12	80	Distillate			B. Bernard.
15	50	do	1,200	23 by 54	Do.
					Nels Nelson.
14	92	Distillate	1,240	30 by 60	F. Middaugh.
					C. Servatius.
35	140	Crude oil	2,000	36 by 92	C. Mitchell.
					John Mathews.
17	90	Steam	1,600	32 by 96	A. N. Kittilsen.
14	50	Distillate	1,000	24 by 40	Frank Sundquist.
					Andy Anderson.
12	40	Distillate	700	24 by 46	Philip Ernst.
12	80	Steam	1,000	34 by 68	O. W. Flowers.
18	50	Distillate	1,000	26 by 50	C. E. Kimball.
12	60	do	1,000	28 by 60	Do.
					H. Fries.
					H. Ames & A. Guinan.
					George A. Adams.
					Joseph Belleview.
18	107	Distillate	1,400	30 by 62	
16	107	do	2,000	30 by 62	Iver Johnson.
15	87	do	1,000	30 by 60	V. Julian.
15	90	do	1,000	34 by 60	James Kelliher.
13	60	do	1,000	30 by 60	C. E. Kimball.
13	60	do	1,000	28 by 60	Do.
12	60	do	1,000	28 by 60	C. L. Peck.
12	50	do	1,000	28 by 60	Gilbert A. Russell.
35	310	Electricity	7,000	48 by 114	John Miles.
70	330	do	6,000	48 by 114	Do.
70	330	do	6,000	48 by 114	Do.
16	120	Steam	1,600	38 by 87	G. F. Ramsey.
8	18	Distillate		16 by 24	Charles Spencer.
12	60	Steam	1,000	34 by 68	J. F. Plein.
9	90	Distillate	1,200	30 by 60	W. W. Johnson.
12	80	Steam	1,000	34 by 60	C. O. Seiverson.
12	225	Electricity	4,000	40 by 86	R. S. Oglisby.
15	120	Distillate	1,200		Corey C. Brayton.
25	130	Steam	2,000	45 by 85	J. A. Malloch.
					Max Hirshberg.
					A. N. Kittilsen.
12	75	Distillate	1,000	25½ by 50	Charles Milacek.
25	160	do	2,200	30 by 75	Fred M. Ayer.
12	90	do	1,000	40 by 60	Jerry L. Wilson.
					J. A. Welch.
14	87	Distillate	1,000	28 by 60	W. W. Johnson.
30	295	Steam	2,000	54 by 87	Ed. L. Smith.
					C. J. Berry
16	85	Steam	1,000	45 by 90	G. Aarons.
18	107	Distillate	2,000	30 by 62½	J. E. Riley.
		do			Do.
26	300	Electricity	5,000	46½ by 95	E. A. Austin.
					Charles Herron.

TABLE 9.—*Data on lode mines in Alaska, 1916.*

SOUTHEASTERN ALASKA.

Operator.	Mine.	Local address.	Manager.
Admiralty Alaska Gold Mining Co		Juneau	W. S. Peckovich.
Alaska Gold Belt Mining Co		do	A. B. Dodd.
Alaska Gold Mines Co	Perseverance	do	B. L. Thane.
Alaska Industrial Co. (See Sulzer, C. A.)			
Alaska Juneau Gold Mining Co	Alaska Juneau	Juneau	P. R. Bradley.
Alaska Mexican Gold Mining Co	Mexican	Treadwell	Do.
Alaska Treadwell Gold Mining Co	Treadwell	do	Do.
Alaska United Gold Mining Co	700 Foot	do	Do.
Do	Ready Bullion	do	Do.
Chicagoff Mining Co	Chicagoff	Chichagof	J. R. Freeburn.
Crystal Gold Mining Co		Snettisham	Bernard Heine.
Dunton Gold Mining Co	Dunton	Hollis	C. H. Dunton.
Eagle River Mining Co	Eagle River	Amalga	B. L. Thane.
Ebner Gold Mining Co	Ebner	Juneau	George Osborne.
Goldstream Mining Co	Goldstream	Ketchikan	
Goodro Mining Co	Goodro	do	S. J. Goodro.
Granby Con. Ming., Smltng, & Power Co	It	Hadley	M. W. Sweetser.
Do	Mamie	do	Do.
Jualin Alaska Mines Co	Jualin	Juneau	H. G. Young.
Juneau Sea Level copper mines		Chichagof	E. E. Fleming.
Kensington Mining Co	Kensington	do	B. L. Thane.
Lakina & Tagish Mines Co	Cymru-Moira	Ketchikan	J. L. Harper.
Mount Andrew Mining Co	Mount Andrew	do	W. J. Rogers.
Nestor Mining Co	Nestor	Hadley	John Wick.
Northland Development Co		Craig	P. A. Tucker.
Pacific Coast Gypsum Co	Gypsum	Gypsum	D. C. Stapleton.
Princeton Mining & Milling Co		Dolomi	B. A. Eardley.
Ready Bullion Mining Co	Ready Bullion	Hollis	H. W. Webber.
Rush & Brown		Kasaan	U. S. Rush.
Sea Level mine	Sea Level	Ketchikan	
Sulzer, Chas. A. (lessee Alaska Industrial Co. property).	Jumbo	Sulzer	Chas. A. Sulzer.
Thane Exploration Co., B. L		Juneau	B. L. Thane.

COPPER RIVER DISTRICT.

Operator.	Mine.	Local address.	Manager.
Alaska Consolidated Copper Co	Nugget Creek	Strelna	H. W. DuBois.
Great Northern Development Co	Gray's Copper Mountain.	Phillips	E. F. Gray.
Hubbard-Elliott Copper Co	Hubbard-Elliott	Elliott Creek via Strelna.	A. J. Elliott.
Kennecott Copper Corporation	Bonanza	Kennecott	E. T. Stannard.
Do	Jumbo	do	Do.
Lakina & Tagish Mines Co			J. L. Harper.
Mother Lode Copper Mines Co	Mother Lode	McCarthy	W. B. Handcock.
North Midas Copper Co		Strelna	O. J. Berg.

PRINCE WILLIAM SOUND.

Operator.	Mine.	Local address.	Manager.
Alaska Gold Mining Co. (formerly Black Diamond).		Valdez	Geo. F. White.
Alaska Mines Corporation	Schlosser	do	E. D. Reiter.
Alice Mines (Ltd.)	Alice	do	M. J. Callaghan.
Bennett-Daley mine	Bennett-Daley	do	Samuel Pepper.
Big Four mine	Big Four	do	A. Wilcox.
Black Diamond. (See Alaska Gold Mining Co.)			
Cameron-Johnson Gold Mining Co. (See Valdez Gold Co.)			
Cliff mine	Cliff	Valdez	H. E. Ellis.
Cube Mines Co., The		do	Jefferson Divinney.
Ellamar Mining Co	Ellamar	Ellamar	L. L. Middelkamp.
Ellis Imperial Mining Co		Valdez	H. E. Ellis.
Fidalgo Mining Co	Fidalgo	Ellamar	William Mackintosh.
Galena Bay Mining Co	Galena Bay	Valdez	Chas. Simonstead.
Gold King mine	Gold King	do	Owners: Frank Gustaveson, Angus Chishom, Gus Nelson.
Granby Consolidated Mining, Smelting & Power Co.	Midas	do	Palmer J. Cook.
Granite Gold Mining Co	Granite	do	W. R. Millard.
Irish Cove Copper Co	Irish Cove	Ellamar	W. A. Dickey.
Kennecott Copper Corporation	Beatson	Latouche	E. T. Stannard.
Do	Bonanza	do	Do.
Landlock Bay Copper Co	Landlock Bay	Ellamar	W. A. Rystrom.

TABLE 9.—*Data on lode mines in Alaska, 1916*—Continued.

PRINCE WILLIAM SOUND—Continued.

Operator.	Mine.	Local address.	Manager.
Mineral King Mining Co	Mineral King	Valdez	Russel Herman and Glen Eaton.
Mountain King mine	Mountain King	do	W. L. Smith.
Ramsey-Rutherford Mining Co	Ramsey-Rutherford.	do	Henry Deyo.
Reynolds-Alaska Development Co		Latouche	Archie Hancock.
Sea Coast Mining Co	Sea Coast	Valdez	
Sealey-Davis Mining Co	Sealey-Davis	do	E. C. Sealey and J. M. Davis.
Sweepstake Mining Co	Sweepstake	do	A. L. Singletary.
Thomas-Culross Mining Co	Bugaboo	do	Don M. Thomas.
Three Man Mining Co	Three Man	Ellamar	W. A. Dickie.
Valdez Gold Co. (formerly Cameron-Johnson Mining Co.).		Valdez	— Saint.
Valdez Mining Co		do	

KENAI PENINSULA.

Operator.	Mine.	Local address.	Manager.
Bluebell mine	Bluebell	Seward	Charles Hubbard.
John Gilpatrick	Gilpatrick	do	John Gilpatrick.
Hickey Mining Co		do	
Kenai-Alaska Gold Mining Co		do	J. R. Hyden.
Lucky Strike mine	Lucky Strike	do	John Hirshey.
Moose Pass Mining Co	Moose Pass	do	Henry Salisbury.
Primrose mine	Primrose	do	Charles Hubbard.
Ronan & James		do	
Slater, John B		do	John B. Slater.
Scheen-Lechner mine	Scheen-Lechner	do	H. Hoben.
Stetson Creek Mining Co		do	

WILLOW CREEK.

Operator.	Mine.	Local address.	Manager.
Alaska Free Gold Mining Co. (See Martin, Wm.)			
Brooklyn Development Co		Knik	
Gold Bullion mine (see Willow Creek mine).			
Independence Gold Mines Co	Independence	Knik	L. S. Robe.
Mable Milling, Mining & Power Co		do	W. E. Bartholf.
Martin, William (lessee, Alaska Free Gold property).		do	William Martin.
Willow Creek mines (lessee, Gold Bullion property).	Gold Bullion	do	J. H. Collier.

FAIRBANKS DISTRICT.

Operator.	Mine.	Local address.	Manager.
American Eagle mine	American Eagle	Fairbanks	
Bondholder mine, The	Bondholder	do	E. Tyndall.
Chatham Mining Co		do	Si Scrafford.
Crites & Feldman	Crites & Feldman.	do	C. Crites.
Friedrich, Alois		do	Alois Friedrich.
Goyot, L. G		do	L. G. Goyot.
Homestake Mining Co	Homestake	do	Joseph Henderson, lessee; G. St. George, owner.
Mayflower mine	Mayflower	do	Thos. Gilmour & Stevens.
Mizpah mine	Mizpah	do	A. Hess.
McArthur, W. T		Berry	W. T. McArthur.
McCarthy mine	McCarthy	Fairbanks	John McCarthy.
McNeil-Huddleson mine	McNeil-Huddleson	do	Mike McNeil.
Newsboy Mining Co	Newsboy	do	Louis Golden.
Poz & Contadi		Olnes	Joe Poz and John Contadi.
Reliance Mng. Co	Reliance	Fairbanks	— Spalding.
Rhoads-Hall Mining Co	Rhoads-Hall	do	L. B. Rhoads.
Tanana Hydraulic & Quartz Mng. Co		do	
Thomas, Hagel, McCann & Micheally		Berry	David Thomas, Frank Hagel, James McCann, and John Micheally.
Wyoming & Colorado mine	Wyoming and Colorado.	Cleary	Tony Goeseman.
Wood, Richard	Eagle Antimony	Fairbanks	Richard Wood.

TABLE 10.—*Data on placer mines in Alaska, 1916.*

Operator.	Claim.	Creek.	Local address.
CHISANA DISTRICT.			
Best & Green	No. 7	Bonanza	Chisana.
Hill & Jensey		Sargent	Do.
James & Nelson		Bonanza	Do.
McLellen & Fagelbury		Bug Gulch	Do.
Murie & Costello	No. 10	Bonanza	Do.
Stanley, L. V		do	Do.
Taylor & McLellen	No. 3	do	Do.
Whitman, Carl	No. 2	Little Eldorado	Do.
Wright & McNutt	No. 11	Bonanza	Do.
CIRCLE DISTRICT.			
Adamik, Martin			Woodchopper.
Anderson, J. P			Miller House.
Armstrong, Charles			Woodchopper.
Bayless, Otto G			Deadwood.
Beatson & Nelson			Woodchopper.
Berry, C. J			Miller House.
Bloom, Pete			Deadwood.
Boyle, Charles			Woodchopper
Boyle, John			Do.
Clark, A. P			Miller House.
Cochran, John Doe			Woodchopper.
De Michael, Michael			Circle.
Erickson, Riley			Deadwood.
Fenlanson, Chris			Woodchopper.
Fisher, August			Do.
Garner & Berry			Miller House.
Gibbon, Billy			Woodchopper.
Greep, Harry			Deadwood.
Holstrum, John			Woodchopper.
Ingalsbe, Al			Deadwood.
Kelly, J. F			Miller House.
Kronjaeger, Alfred			Deadwood.
Larson, Chris			Woodchopper.
Lee, O. B			Do.
Marigold Mining Co			Miller House.
Matthews, Dave			Woodchopper.
Morel & Johnson			Deadwood.
Phillips, Thos			Do.
Pompal, Jos			Do.
Powers, George			Woodchopper.
Sather, Antone A			Deadwood.
Scesniak, Frank			Woodchopper.
Slaven, Frank			Do.
Van Bibber, Pat			Deadwood.
COPPER RIVER DISTRICT.			
Bergman, Fred		Big Four Gulch	Dempsey.
Brooks, E. W		Jolly Gulch	Nazina.
Canaille Bros		Big Four Gulch	Dempsey.
Carvey, Bert		Rex	Nazina.
Dan Creek Mining Co		Dan	McCarthy.
Elmer, J. M		Slate	Dempsey.
Esterly & Andrus		Chititu, Rex	Nazina.
Grosh, John		Miller Gulch	Dempsey.
Holmes & Brail		Upper Chesna	Do.
Kraemer, Hemple & Leavell		Slate, Miller Gulch	Do.
Miller, John S		do	Do.
Meyer & Prolig		Slate	Do.
Schroeder, William		Miller Gulch	Do.
CROW CREEK DISTRICT.			
Alaska Crow Creek Mining Co		Crow	Girdwood via Anchorage.

TABLE 10.—*Data on placer mines in Alaska, 1916*—Continued.

FAIRBANKS DISTRICT.

Operator.	Claim.	Creek.	Local address.
Atwood, Harry	No. 11	Goldstream	Fox.
Bean, Z. C	No. 3	Wolf	Cleary.
Bleeker, Fred	No. 4	Goldstream	Fox.
Bostrom, Gus	No. 5	Cleary	Cleary.
Buren, Isaac	No. 6	do	Do.
Burns & Gorgens		Head of Chatam	Do.
Canning, James	No. 3, 2d tier	Dome	Olnes.
Casalegno Brothers			Fairbanks.
Christainsen, Sam	Gold Hill	Ester	Berry.
Connelly, Frank	No. 15 below	Cleary	Chatanika.
Cook, Henry	Oregon Assoc	Vault	Vault.
Cook, Nick	No. 11 bench	Goldstream	Fox.
Dixon, William	No. 15 below	Cleary	Chatanika.
Driscoll Brothers	No. 14 below	do	Do.
Edmonds & Broadhurst	No. 1 below	Little Eldorado	Eldorado.
Erickson & Anderson	No. 3 below	do	Do.
Erickson, Charles	No. 2 above	Wolf	Cleary.
Foster, W. H	Fraction between No. 11 and No. 12 below.	Cleary	Chatanika.
Fraker & Nelson	No. 7 above	Little Eldorado	Eldorado.
Froseth, A. C	No. 7 below	Cleary	Cleary.
Fuller & Dunlap	Crackerjack bench.	Chatanika River	Chatanika.
Griffen & Grille	No. 5 below	Fairbanks	Meehan.
Guis, Charles		Gilmore	Gilmore.
Guis, Louis	No. 5	Pedro	Do.
Hanot, Charles	No. 1 below	do	Golden.
Hanson & Nelson	Serpentine Assoc.	Chatanika River	Chatanika.
Hess, Hans	Eldorado Assoc., Middle.	Little Eldorado	Eldorado.
Hilty, Al	No. 1 below	Cleary	Cleary.
Holm, Gust	Gold Hill	Ester	Berry.
Holmlund, A. J	No. 2, tier bench	Chatanika River	Chatanika.
Hoover & Larson	Hope Bench	do	Do.
Housdale & McDonald	No. 3 above	Little Eldorado	Eldorado.
Iverson, O	No. 5 below	do	Do.
Johnson, George	No. 13 below, 2d tier bench.	Cleary	Chatanika.
Johnson, Ludvig	No. 17	Goldstream	Fox.
Kellen & Dalton	Discovery	Little Eldorado	Eldorado.
Keys & Sons, E. M	No. 1	Ready Bullion	Berry.
King & Nelson		Pedro	Gilmore.
Kleinsmith, Victor (see Niggerhead Assoc.)			
Leach, John	No. 13 below	Cleary	Chatanika.
Leach & Bernard	No. 1 above	Ester	Berry.
Leedy, William	No. 4 above	do	Do.
Letender, John	No. 3 above, 1st tier	Dome	Olnes.
Lokka, John	No. 3 below	do	Do.
Maisingseth, M	Nigger Baby Fraction.	Cleary	Chatanika.
Martin, M. J	No. 6 below	Fairbanks	Meehan.
Martin & Blake	No. 15 below, 2d tier bench.	Cleary	Chatanika.
Marx, Guy	No. 9	Goldstream	Fox.
Morris, T	No. 17 below	Cleary	Chatanika.
McPike, John	Discovery	Goldstream	Gilmore.
Nelson, Frank	No. 1 above	Little Eldorado	Eldorado.
Niggerhead Association		Dome	Olnes.
Nerland, C. O	No. 2 above	do	Do.
Oberg & Furland	No. 3 below	Dome Creek Bench	Do.
Parker, Fred	No. 3 above	Fairbanks	Meehan.
Pearson & Jacobson	No. 5 below	do	Do.
Pearson & Johnson	No. 6 below	Cleary	Cleary.
Quirk, Tom	No. 11 below	Dome	Olnes.
Raymond & Carey	No. 11 below	Cleary	Chatanika.
Rehn, Theodore		Little Eldorado	Eldorado.
Rogge, Leo W	No. 6 above	Cleary	Cleary.
Sagen, Alois	Paystreak Fraction.	Ester	Berry.
Sather, Martin	No. 12 below	Fairbanks	Meehan.
Scannell, Tim	No. 14 below, 1st tier bench.	Cleary	Chatanika.
Shon, C. E	No. 12 below	do	Do.
Sjolseth, J. L	Top of the Ridge	Ester	Berry.
Skoftland, Tom	No. 5 below	Little Eldorado	Eldorado.
Smith & McGlone	Mohawk Extension.	St. Patricks	Berry.
Soderbloom, Gus	No. 15 below	Fairbanks	Meehan.
Stewart, Tool, Powell & Williams	No. 18 below	do	Do.

TABLE 10.—*Data on placer mines in Alaska, 1916*—Continued.

FAIRBANKS DISTRICT—Continued.

Operator.	Claim.	Creek.	Local address.
Stutt, George	Gold Hill	Ester	Berry.
Sullivan & Olson	No. 1 above	do	Do.
Sundine, John	No. 6 below	Fairbanks	Meehan.
Takkle, Isaac	No. 4 below	Dome	Olnes.
Thompson, A. D.[a]	Steer Bench	Chatanika River	Chatanika.
Thomas, Theodore	No. 12	Goldstream	Fox.
Wagner, Henry	No. 6	do	Do.
Weiss, Sam	No. 14 below, 3d tier bench.	Cleary	Chatanika.

HOT SPRINGS (MANLEY) DISTRICT.

Operator.	Claim.	Creek.	Local address.
Bock, A		Deep	Tofty.
Brandstrom & Anderson		Eureka	Eureka.
Frank & Graham		Pioneer	Do.
Glenn Mining Co			Do.
Howell & Cleveland		Woodchopper	Tofty.
Hosler, D. J		American	Hot Springs.
Johnson, Ed		Eureka	Eureka.
Jones & Stewart		Cash	Tofty.
Kanally & Hasting		American	Hot Springs.
Lane, A. H		Eureka	Eureka.
Murray, Michael		American	Hot Springs.
McKinzie, J	Gold Age	Miller	Tofty.
Ness, Edward		American	Hot Springs.
Olsen & Everson		Eureka	Eureka.
Peterson & Davidson		Boulder	Tofty.
Stevens, Frank		Eureka	Eureka.

IDITAROD DISTRICT.

Operator.	Claim.	Creek.	Local address.
Beatson, Bates, Longtin & Dawson	No. 1 below	Otter	Flat City.
Brevis, J. L		Willow	Do.
McKinzie & Mathewson		Chicken	Do.
McMillan, R	Discovery Bench	Otter	Do.
Manley, Frank		Willow	Do.
Rilley & Marston		Otter & Black	Do.
Strandberg, Dave	Link, Madden Bench, and Upgrade Placer.		Do.
Welch, Al		Happy	Do.

INNOKO DISTRICT.

Operator.	Claim.	Creek.	Local address.
Greer & McNulty		Boob	Cooper.
Harling, Tom		Yankee	Ophir.
Pitcher & Van Orsdale		Tolstoi	Cooper.
Reich, John	No. 5 below	Gaines	Ophir.
Schwasball, Andy		Tolstoi	Cooper.
Snailey Brothers		Ophir	Ophir.
Spencer, Fred		Gaines	Do.
Thorn & Higgins	Hippard Fraction	do	Do.
Vibh, Nels	No. 2 above	do	Do.
Warren & Coutts	No. 11 above	do	Do.

KENAI PENINSULA.

Operator.	Claim.	Creek.	Local address.
Alaska Securities Corp			Seward.
Mathison Mining Co			Hope.
Pearson, A. & H			Do.
Renner, John			Sunrise.
St. Louis Mining & Trading Co			Hope.

[a] Not mining.

TABLE 10.—*Data on placer mines in Alaska, 1916*—Continued.

KOYUKUK RIVER.

Operator.	Claim.	Creek.	Local address.
Collins, Ernest M.			Wiseman.
Holzer & Wilson Mining Co.			Do.
Pingel, H.			Do.
Smith, Ellingson & Nelson			Do.
Watts, Vernon			Do.
Webster & Co., Daniel			Do.
Williams, Mrs. Mary			Do.
Wooll, John E.			Do.

MARSHALL (WADE HAMPTON) DISTRICT.

Operator.	Claim.	Creek.	Local address.
Anderson, Johnsen & Dahl	No. 1	Fox Gulch	Fortuna Ledge.
Betsch, Jean, McGrath & McDonald	No. 1 above	Willow	Do.
Heckman & Webber	Lower Discovery	do	Do.
Mack & McKinzie	Upper Discovery	do	Do.
Nelson, Nels	No. 4 above	do	Do.
Pilcher, George M		Elephant	Do.
Smith & Giacherio	No. 2 above	Willow	Do.
Waskey, Frank	Bumblebee	do	Do.

RUBY DISTRICT.

Operator.	Claim.	Creek.	Local address.
Anderson & Johnson	No. 3 above	Long	Long City.
Bittle & Lindegarde		Spruce	Poorman.
Black & Leveredge	No. 4	Flat	Do.
Buckley Brothers	Novikaket Assoc.	Long	Long City.
Cook, Charles		Poorman	Poorman.
Coyle Bros. & O'Donnell		do	Do.
Coyle, John		Spruce	Do.
Felton, Alex	No. 3	Tenderfoot	Do.
Gidling & Anderson	No. 2	Bear Pup	Long City.
Graham & Walker	Novikaket Assoc.	Long	Do.
Hegstrom & Nelson	No. 1	Straight	Do.
Herman & McKinnon	No. 2	Duncan	Poorman.
Jones & Lundin	Alabama Assoc.	Birch	Long City.
Kells, A	Windy Bench	Long	Do.
Kigbush, Davis & Olson	Hagan Fraction	Poorman	Poorman.
LaBelle, Joseph		Tamarack	Do.
Larson, Alex	No. 1 above	Long	Long City.
Matheson, Girlund & Wick		Spruce	Poorman.
Miller & Pike	Wedge Fraction between No. 2 and No. 3.	Bear Pup	Long City.
Monahan, John		Spruce	Poorman.
McCloud, D	Windy Claim	Flat	Do.
Nixon & Manual		Poorman	Do.
Neihoff, Knute & Ditz		Spruce	Spruce.
Salch, Walker & Ditz	Mascott Bench	Long	Long City.
Shorpshear, J. F	No. 2 Bench	Poorman	Poorman.
Strite, Charles	No. 3	Bear Pup	Long City.
Swanson & Cale		Fourth of July	Do.
Thompson, Morton, Johnson & McLaoughlin	Banner	Flat	Poorman.
Van Winkle & Wallace	Buckeye Bench	Long	Long City.
Ward, Drake & Kells	Novikaket Assoc.	do	Do.
Ward & Bishop		Tamarack	Poorman.
Willeke, Herman	Surprise Fraction	Poorman	Do.
Wyman & Balanger	O. K.	Head of Flat	Do.
Yukon Gold Co		Greenstone	Long City.

SEWARD PENINSULA.

Operator.	Claim.	Creek.	Local address.
Arctic Mining Co		Bangor	Nome.
Brown, Robert		Sweepstake	Haycock.
Candle Ditch Co	Bully Hill		Candle.
Carlson, Gabe		Tundra near Little	Nome.
Clark, Harry		Dexter	Do.
Coggins, Bernard		do	Do.
Connely & Jensen		Gold Bottom	Do.
Connelly & Bros., Tom		Dexter	Do.
Cordovado, A. V	Bessie Bench	Holyoke	Do.
Dakota-Alaska		Boulder	Do.
Fairhaven Mining Co		Inmachuck River	Deering.
French, A. E		Jump	Candle.

TABLE 10.—*Data on placer mines in Alaska, 1916*—Continued.

SEWARD PENINSULA—Continued.

Operator.	Claim.	Creek.	Local address.
Gewiler & Gloor		Dime	Haycock.
Gillette & McMillan		Center	Nome.
Gum, Henry		do	Do.
Gunderson, Lars		Dime	Haycock.
Hanson, Olson & Evans		Candle	Candle.
Jepson, Carl		Sweepstake	Haycock.
Kronquist, F. S		Candle	Candle.
Landstrom, A. J		Little	Nome.
Lee Brothers & Halloran		Candle	Candle.
Lovell, C. O		Dime	Haycock.
Lundberg, O. A		Candle	Candle.
McCoy, F. J		Sweepstake	Haycock.
McGann, Thomas		Jess	Nome.
Madsen, Jens		Dime	Haycock.
Mebes, Fred		Submarine Beach	Nome.
Nelson, Nels	Diamond L		Do.
Nordlund Brothers		Candle	Candle.
Olson Brothers		Dime	Haycock.
Olson, Otto W	Tundra Assoc.	Little	Nome.
Orhem & Brown		Dexter	Do.
Peterson, Peter X		Buster	Do.
Pioneer Mining Co		Little	Do.
Porter, Wallace		Dime	Haycock.
Ravenkilda & Jenson		Jess	Nome.
Reed, C. T		Mountain	Do.
Regling & Olson		Dime	Haycock.
Roberts, E. A		Crooked	Council.
Rouse, Thomas		Inmachuck River	Deering.
Ryden, A		Bear	Candle.
Smith, Samuel		Dime	Haycock.
Stewart, A. C		Sledge	Nome.
Stonehouse, John		Buster	Do.
Sunset Mining Co		Sunset	Teller.
Sutton, W. L		Dime	Haycock.
Swanberg & Lee		Osborne	Nome.
Valentine & Anderson		Dime	Haycock.
Vogel, Charles	Diamond L		Nome.
Warsing, Frank	do		Do.
Watson, Thomas		Center	Do.
Wilson, Al		Sweepstake	Haycock.

SUSITNA RIVER.

Operator.	Claim.	Creek.	Local address.
Adams, A. A		Falls	Cache Creek via Susitna.
Bubb & Bahern		Dollar	Do.
Carlson, C. J		Lucky Gulch	Valdez Creek via Gulkana.
Duff, Clark		Valdez	Do.
Eberhart & Anderson		Falls	Cache Creek via Susitna.
Francis & Foster		Long	Do.
Funk, J. C		Falls	Do.
Gage & Mack		Thunder	Do.
Giedaken, Wm		Bird	Do.
Gray, John		Treasure	Do.
Hamersmith, Chris		Bird	Do.
Hansen, Chris		Willow	Do.
Harper Bros		Nugget	Do.
Jenkins, Frank		Willow	Do.
Kast, Nelson & Larsen		Poorman	Do.
McElroy & Remmer		Falls	Do.
Peterson, William		Cache	Do.
Price, Hugh		Nugget	Do.
Raymond, Carl		do	Do.
Rice, John		Willow	Do.
Richardson, R		Ramsdyke	Do.
Smith & Hogan		Nugget	Do.
Tesmer & Biedermann		Cache	Do.
Thunder Creek Mining Co. (M. A. Ellis, manager).		Thunder, Windy	Do.
Valdez Placer Mines Co		Valdez	Valdez Creek via Gulkana.
Van Eiderstein & Zindel		Peters	Cache Creek via Susitna.
Weatherall & Andersen		Gold	Do.
Wolf & Maloche		Spruce	Do.

TABLE 10.—*Data on placer mines in Alaska, 1916*—Continued.

TOLOVANA DISTRICT.

Operator.	Claim.	Creek.	Local address.
Allendale, William		Livengood	Brooks.
Craig & McKinnon	Hidden Treasure Association.	do	Do.
Crook, Henry	Ready Bullion	do	Do.
Dooling & Pater	Discovery Bench	do	Do.
Johnson & Bostrom	Gold Dollar Association.	do	Do.
Jorgenson & Patton	Eldorado Bench	do	Do.
Kelly, Sampson & Colbert	Gold Dollar Association.	do	Do.
Kettleson & Curry	No. 17 above	do	Do.
Koebach & Eagler	No. 16 above	do	Do.
Lind, Pierce & Cramer	Gan Association	do	Do.
Paterson & Finley	Deep Channel Association.	do	Do.
Peterson & Anderson	Marriettee Bench	do	Do.
Peterson & McKinnan	Gold Dollar Association.	do	Do.
Peterson & Nelson	Virginia Association.	do	Do.
Price & Camos	Eagle Bench	do	Do.
Revis, Nash, Miller & Clausen	Fish Association	do	Do.
Shaw & Doggett	Sunnyside Bench	do	Do.
Zuber & Altman	do	do	Do.

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